

CANADIAN GEOGRAPHICAL JOURNAL

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No. 6



CANADIAN TUNNELLERS AT GILBRATAR
FORESTRY IN QUEBEC:—PAST—PRESENT—FUTURE
GEOGRAPHY AND NATION PLANNING

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We Can Do Better...

IN the past, wars have brought with them a high cost of living, ending with inflation.

This sapped the strength of nations and added poverty and injustice to the other tragedies of war.

Later it has led to falling prices and unemployment.

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We have done much to avoid a repetition of the disastrous price rises of previous wars.

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Holding the ceiling has been a struggle. But the results have been worth while. From 1914 to 1919 prices rose 60%. From 1939 to 1944 the rise has been only 18%.

This effort of the Canadian people has been successful enough to be noted in other countries.

But we must continue to hold the line. We need not let history repeat itself. We can do better.

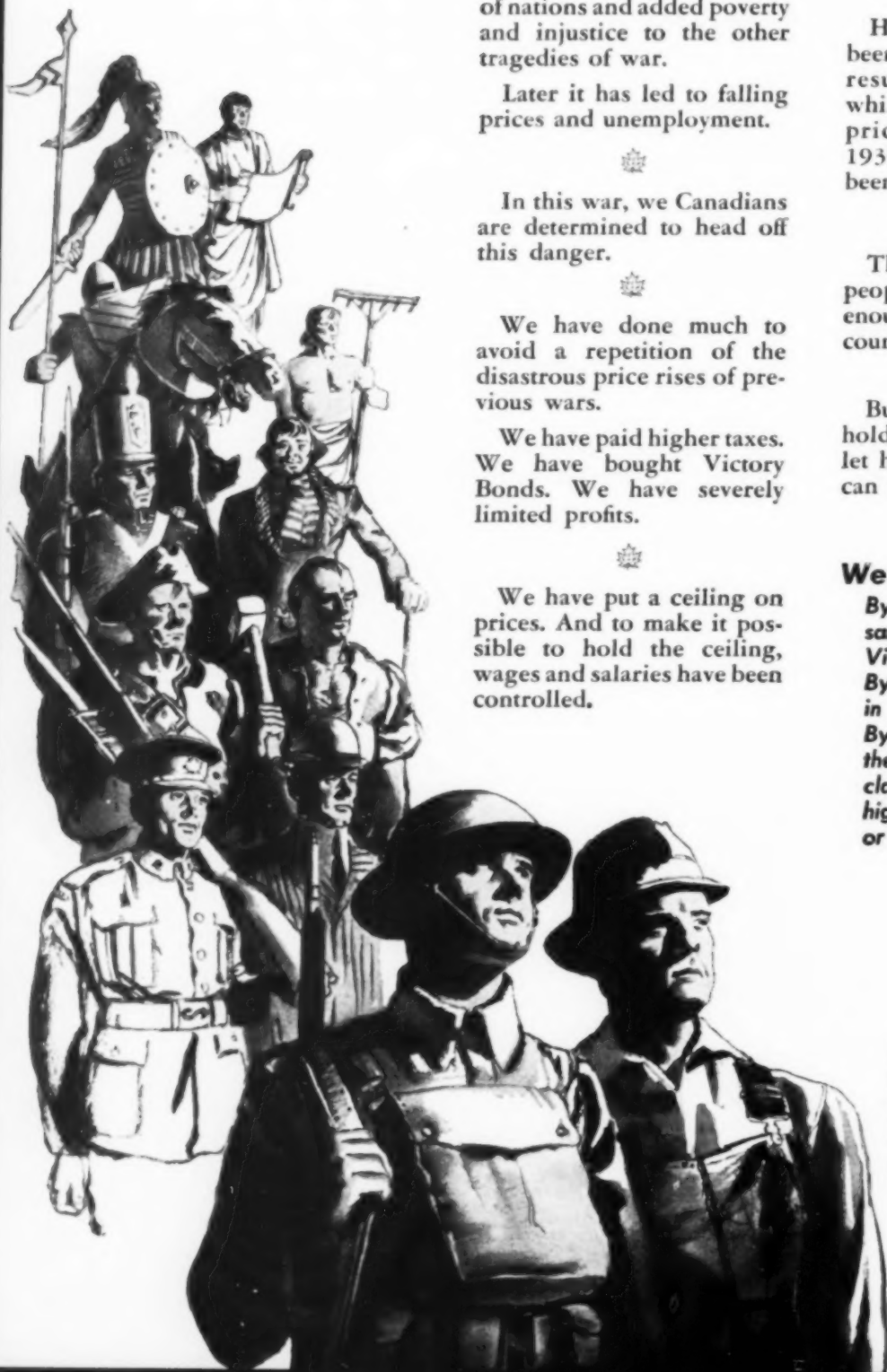
We can all help —

By cutting down unnecessary spending, and buying Victory Bonds instead.

By not hoarding or buying in black markets.

By not taking advantage of the war situation to press claims for higher prices, higher wages, higher rents, or higher profits.

(This advertisement is one of a series being issued by the Government of Canada to emphasize the importance of preventing further increase in the cost of living now and deflation later.)



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Contents

JUNE 1944

VOLUME XXVIII No. 6

COVER SUBJECT:—The Gibraltar Key which was presented to Canadian Tunnellers who served at Gibraltar.

	PAGE
CANADIAN TUNNELLERS AT GIBRALTAR by MAJOR GEORGE F. G. STANLEY	244
FORESTRY IN QUEBEC: PAST—PRESENT—FUTURE by AVILA BÉDARD	258
GEOGRAPHY AND NATION PLANNING by GRIFFITH TAYLOR	281
EDITOR'S NOTE-BOOK	VII
AMONGST THE NEW BOOKS	XI

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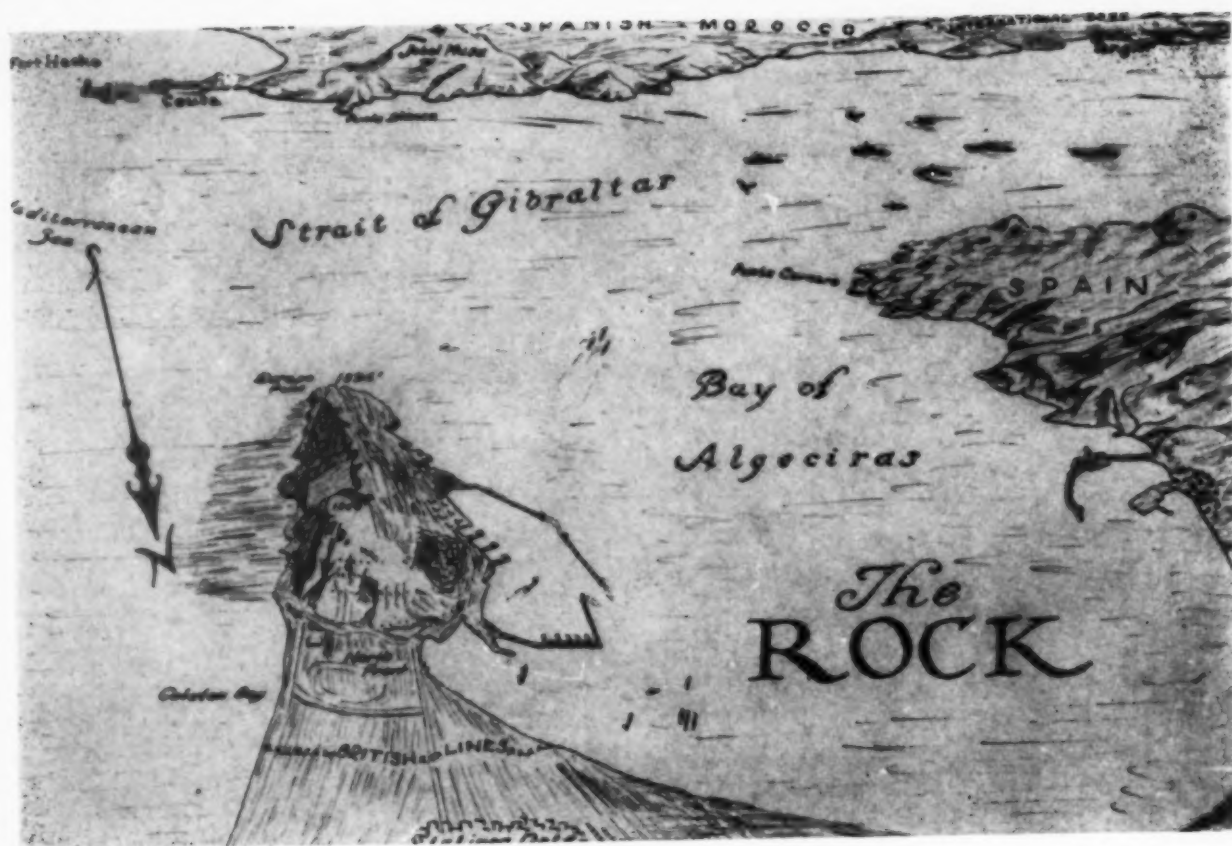
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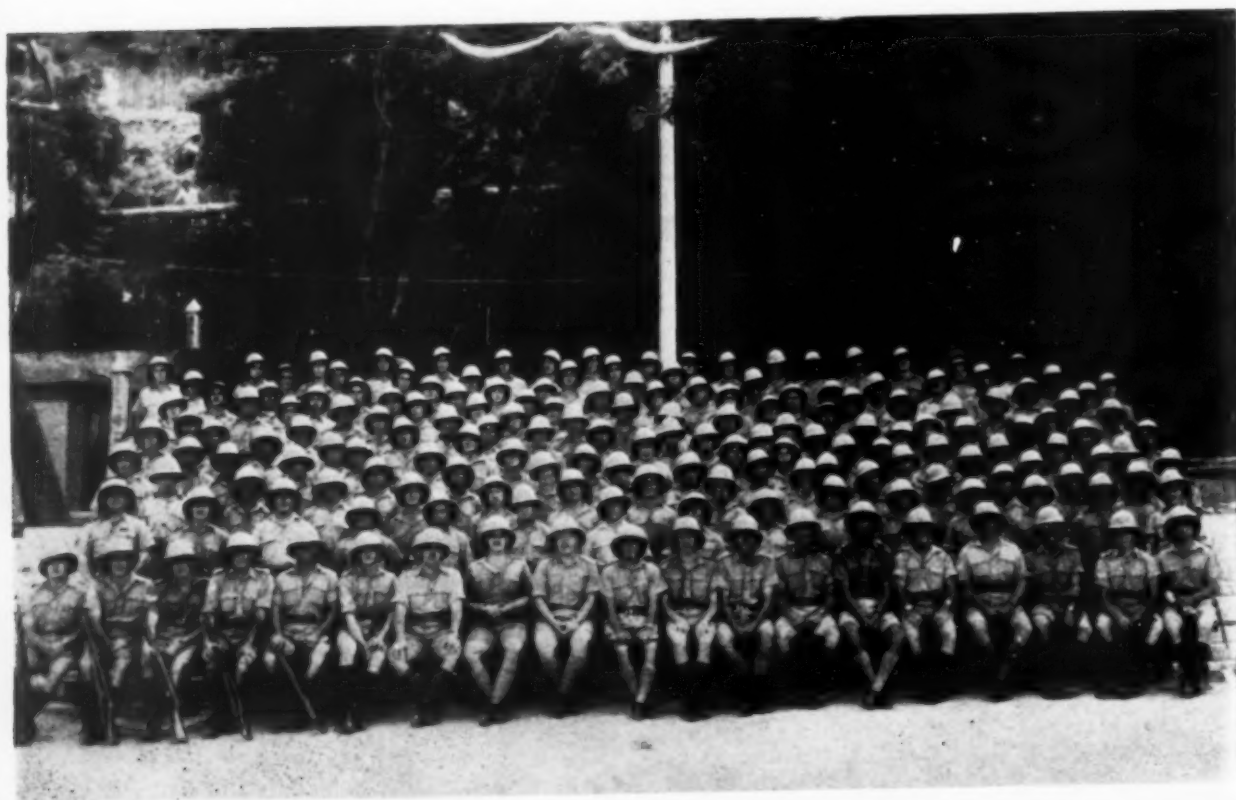
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Sketch map of the Rock of Gibraltar by Sapper R. J. Cunningham, R.C.E.

Officers and men of No. 2 Tunnelling Company, R.C.E., at Gibraltar



CANADIAN TUNNELLERS AT GIBRALTAR

by MAJOR GEORGE F. G. STANLEY

THE maintenance of a large military establishment has never been a feature of Canadian military policy. To the casual observer comparing the peace-time organization of the Canadian Militia with the formidable array of specialized and technical units required during periods of hostilities, this might seem a source of weakness. Such a view, however, would ignore the essential fact that in Canada practically every technical branch of military endeavour finds a counterpart in the civilian life of the Dominion. Broadly speaking, military and civil requirements in technical services such as engineers, signals, railroaders or forestry, are not greatly dissimilar; and for this reason Canada has been able, both during the last war and the present, to mobilize rapidly her specialized peace-time knowledge and adapt it to war purposes.

In no instance is this fact better illustrated than in the case of the tunnelling units of the Royal Canadian Engineers. During the war 1914-18 Canadian miners played an important part in the mining and countermining operations on the Western Front, and when, after Munich, the war clouds began to gather once more upon the international horizon, Canadian mining engineers and others interested in the mining industry in Canada began to consider the possibilities of turning to the military advantage of the Empire the special equipment and technique developed in the mines of the Dominion of Canada.

The Organization of No. 1 Tunnelling Company, R.C.E.

It is a matter of some interest to Canadians that even before the outbreak of war in September, 1939, proposals were made, both to the British and Canadian Governments, that Canadian mining engineers might visit Europe to examine likely fields of battle and report upon the feasibility of diamond drilling and horizontal boring as a means of offensive against the German Siegfried Line.

On 16 September, 1939, Mr. J. Y. Murdoch, on behalf of the Mining Fraternity in Northwestern Quebec and North-

ern Ontario, wrote to the Minister of National Defence (Hon. Ian Mackenzie) to further the object of using diamond drilling to break the Siegfried Line. He outlined a plan for boring and for laying heavy charges, and suggested that a unit raised from diamond-drill men, and directed by military engineers experienced on the Western Front in the years 1915-1918 should experiment. He "would gladly undertake any work you think I could do in this connection". The matter was placed in the hands of the Director of Engineer Services, Brigadier (later Major-General) E. J. C. Schmidlin, who noted that in principle the method had been used in military operations in 1915-1918. He had had similar proposals from other sources, and was collecting information on the equipment and methods in use with a view to experimentation.

Following upon this, the President of the Ontario Mining Association (Mr. Robert A. Bryce) wrote on 4 October, 1939, to the Minister of National Defence (Hon. Norman McL. Rogers) offering to send a commission of two or three engineers to England and to the front in France to study the situation in company with an experienced British military adviser. He said that the Canadian Mining Industry would bear all preliminary expenses, and that the Association had organized means for furthering the project if the War Office approved. With this letter was a memorandum, prepared by a technical committee and dealing with the application of civil methods to military needs.

These proposals were communicated to the War Office and the cabled reply read "Most interested, your proposals are being investigated".

One of those active in investigating practical possibilities was Lt.-Col. C. S. L. Hertzberg, an officer of the Non-Permanent Militia, soon to be Commander Royal Engineers, of the 1st Canadian Division and later Chief Engineer, First Canadian Army, who died recently while on special service with the British Army in India.

General A. G. L. McNaughton, who was appointed Inspector General of the 1st Canadian Division on 5th October, 1939,

was keenly interested in the military possibilities presented by the diamond drill. Despite the fact that his almost every available moment was taken up with the task of organizing the Division for service overseas, General McNaughton found time on 30th November to attend a meeting at Toronto of senior military officers, including Lt.-Col. C. S. L. Hertzberg, with the Hon. C. A. Campbell, Minister of Public Works in the Provincial Government of Ontario, and Mr. Oliver Hall, Chairman of the technical committee as the representatives of the mining industry. Here they discussed the question of utilizing Canadian mining methods and equipment for the destruction of enemy fortifications by means of long horizontal holes containing high explosive charges.

It was obvious that much experimental work would have to be done before the practicability of diamond drilling for military purposes could be ascertained. And General McNaughton proposed that the Hon. C. A. Campbell who was also a Lieutenant in the 2nd Field Company, R.C.E., should recruit a special section of hardrock miners from Northern Ontario and Quebec for this purpose. In the absence of an authorized military establishment this section was to be part of the 12th Field Company, R.C.E., of Winnipeg. He suggested that the section might proceed to Great Britain where experiments could be carried out under conditions approximating those which might normally be expected in France. Should these experiments fail to show encouraging results the section would simply carry on as the normal component of a field engineering company.

Special equipment was, of course, required for these experiments. And no funds were available for the purpose. In order to meet this need the Canadian mining industry formed the War Time Mining Association and set about to raise the necessary money. All mining companies in Canada who were in a financial position to contribute were invited to do so. From all quarters the response was most enthusiastic. Both men and funds were soon available, and in January, 1940, Lieutenant (now Lieutenant-Colonel) Campbell proceeded overseas with his soldier miners and 25 tons of special equipment.

Upon arrival in England the necessary arrangements were concluded for the con-

duct of the experiments in diamond drilling and demolitions. The Section was placed directly under the command of Lieutenant-Colonel (later Major-General) C. S. L. Hertzberg, and all personnel were relieved of fatigues and other duties in order to concentrate their full attention upon the work on hand. Mr. Perry Hall, Manager of Royles Brothers, who acted as liaison officer between the Mining Industry and the military authorities in Canada was attached as Civilian Technical Adviser in the use of diamond drills. Subsequently Mr. Hall was commissioned in the Royal Canadian Engineers. Both the British Government and the Anglo-Iranian Oil Company displayed considerable interest in the progress of the experimental drilling programme, and in April a demonstration of the work of the Section was held for the benefit of the Canadian and British authorities.

These experiments did much to reveal the military possibilities of horizontal drilling. They were therefore continued. At the same time General McNaughton approached the Minister of National Defence, the late Hon. Norman McL. Rogers, with a view to increasing the strength of the Special Section to that of a Tunnelling Company, R.C.E. The Minister approved the proposal, and in May, 1940, the formation of No. 1 Canadian Tunnelling Company was authorized. Mr. Hall was then detailed to return to Canada to select the necessary equipment for the Company, which would now be provided from Government funds, and to make arrangements with Canadian mining and diamond-drilling companies for a continuous supply as required.

The success of the Canadian experiments had seized the imagination of certain British General Officers and the request was made that a Special Boring Section from the Canadian Tunnellers might proceed to France for the purpose of preparing signal cable holes for the B.E.F. which would be invisible to air observation. The rapid and unexpected pressure of the German forces on the Western Front put a stop to this project, however, just at a moment when all equipment was packed, motor transport ready, and the men on the point of departure. Their disappointment was keen but there was a variety of new tasks at hand.

In the months which followed Canadian Tunnellers were engaged, not only



Major J. G. Tatham (Larder Lake) and some Northern Ontario officers and men of No. 2 Canadian Tunnelling Company who served at Gibraltar.

in experimental work in different kinds of rock and with different types of equipment, but also in tasks of a secret nature which cannot yet be made public. During 1941 and 1942 detachments of tunnellers of the Royal Canadian Engineers were employed in Scotland completing an important hydro-power development scheme; in Cornwall re-opening some of the ancient tin mines; in different parts of England quarrying for road materials; and throughout the whole of Great Britain in the development of strategic minerals and non-metallic ores for the British Ministry of Supply.

It was in the autumn of 1940 that opportunities of service for which they were specially qualified presented themselves to the officers and men of the Tunnelling Company. In the latter part of October an urgent request was received from the British Government that a detachment of hardrock miners might be made available by Canada for despatch to Gibraltar. Defensive works of consider-

able magnitude and importance were under way on the Rock and trained tunnelling personnel were needed to drill cable and pipe-line shafts and to train British tunnellers in diamond drilling. No time was lost in providing the men asked for. On 15th November the Hon. Colin Campbell, with the rank of Major, sailed for Gibraltar with approximately one hundred men from No. 1 Tunnelling Company. Eleven days later they disembarked upon the Rock. It is of special interest to Canadians to note that these were the first Canadian troops ever to be stationed on the Rock of Gibraltar, whose great bulk has stood as guard over Britain's trade routes to the Levant for nearly two centuries and a half.

It is one of the traditions of Gibraltar that a visit from the Barbary Apes within ten days is a good omen for all new arrivals. The origin of these monkeys is obscured in the mists of antiquity, but it is generally conceded that they were brought to Europe from North Africa at the time of the



Moorish invasion. Owing to their thieving proclivities and periodical visits to the town in search of food, they came to be regarded as a nuisance and proposals were made for their destruction. During the course of years, however, a superstition developed that should the apes leave the Rock, Gibraltar would cease henceforth to be a British colony; and this tradition has become their sanctuary. The auguries were favourable for the Canadians. Within two days the apes accorded them the traditional welcome. The first appearance of the apes was regarded with great interest by the members of the Special Detachment; but when it was found that these visits increased in number and annoyance the Canadians were, to say the least, scarcely flattered at the attention given them.

Gibraltar

The great Pillars of Hercules present an impressive sight to the voyager entering the Mediterranean. On his right are the cliffs of the African coast near Ceuta; on his left the great Rock of Gibraltar.

Top to bottom:—

Hardrock miners operating a stoper in one of the subterranean passages at Gibraltar.

Drilling in the interior of the Rock. The Rock of Gibraltar is a mass of dense grey limestone, lower jurassic in age.

"Mucking out" in Monkey's Cave, where legend has it the monkeys arrived in Gibraltar from Africa.

A Canadian repairs a fuse at the entrance of the tunnel.

Below:—"So I said to my wife, 'Why should I be a darn fool and work?' So I joined the Army." Cartoon by Sapper R. J. Cunningham, R.C.E.



Unless you are worn
on this job... DO NOT
ENTER THIS PORT
without first reporting
the officer or N.C.O.
IT MAY BE DANGEROUS

Probably in some former geological era they were joined to one another by a low-lying stretch of land. To-day they stand guardian at the gateway of the Mediterranean,—the Mare Nostrum of shattered Italian dreams and ambitions.

The whole colony of Gibraltar is less than three miles in length. At its northern extremity it is joined to the Spanish mainland by the flat sandy plain used during more peaceful days as a race-course. Then suddenly the Rock thrusts itself skyward thirteen hundred feet above the level of the sea. The dividing ridge forms a sharp, jagged backbone about two miles long. As it nears the southern tip of the peninsula the Rock falls steeply toward Windmill Hill and Europa Flats. The east face presents a precipitous and at times almost perpendicular escarpment. The west side, however, is less abrupt, and accessible from the town which looks out across Gibraltar Bay toward the Spanish port of Algeciras.

Gibraltar's military past has been a turbulent one. From the date of its capture and fortification by the Saracens as a preliminary to the invasion of the Visigothic Kingdom in 711, the fortress of Gibraltar has undergone many vicissitudes. Kings, dukes and pirates; Moors, Spaniards, Frenchmen, Dutch and English have at different periods held or laid siege to the Rock. Finally, in 1704, during the war of Spanish Succession, British and Dutch naval forces under the command of Sir

Top to bottom:—

Men of No. 2 Tunnelling Company, R.C.E., in front of the beginning of No. 1 drill at the Gort Hospital site

Canadian Sappers using a "plugger" or air drill at Gibraltar.

The entrance to Maple Leaf Tunnel, Gibraltar

Below:—Cartoon by Sapper R. J. Cunningham, R.C.E.





Units of Force H off the Rock of Gibraltar. In the picture are H.M. Ships *Ark Royal*, *Malaya* and *Renown*. Movements of these ships were a matter of great interest to the Canadians at Gibraltar.

George Rooke took possession of Gibraltar after a three-day investment. Sir George acted entirely on his own responsibility. He hoisted the Cross of St. George and took possession in the name of Queen Anne whose government ratified the occupation. A determined effort was made during the years 1779—83 by the French and Spaniards to recover the fortress. For four years the besiegers sought to starve or batter the British out of their defences; but neither scurvy nor the Duc de Crillon was able to prevail against the heroic defenders, whose commander, General Sir George Elliott, ranks as one of the greatest of British soldiers. Spain has never ceased to cast covetous glances at the Rock whenever Great Britain has been involved in war; but, broadly speaking, since 1783 the history of Gibraltar has been comparatively uneventful.

The importance of Gibraltar as a British naval base can scarcely be overestimated. With a hostile power standing at the entrance to the Mediterranean, Malta, Egypt and Suez would be isolated and the British position in the Middle East imperilled. Accordingly, not only have the naval facilities of the harbour been enlarged and improved, but, with the memory of earlier sieges in mind, the defences of the Rock have been greatly strengthened.

The great underground fortifications of Gibraltar were begun during the Great Siege by Sergeant-Major Ince of the Company of Soldier Artificers (subsequently the Corps of Royal Engineers). Little was actually done to extend the work undertaken at this time until the beginning of the present century, when tools and blasting equipment made it possible for tunnellers to cut their way into the belly of the Rock. About 1900 tunnelling was recommenced by the Admiralty for the purpose of water storage. Legend, however, tended greatly to exaggerate the number and strength of the subterranean galleries. No tunnelling work

of any real military significance was done during the period between wars, and when the sudden collapse of France and the entry of Italy into the war brought the Mediterranean into the operational picture, hasty efforts were made to repair the deficiencies resulting from the inaction of former years. The civilians were evacuated; the race-course became an aerodrome; pill boxes and concrete forts were erected; and an extensive programme of tunnelling projected. It was to assist in this programme that Canadian engineers were sent to Gibraltar in 1940.

Scarcely had the first Canadians arrived on the Rock than the British Government again addressed a request to Canada for assistance. On 27 December 1940 Lord Cranborne, the Secretary of State for the Dominions, asked the Rt. Hon. Vincent Massey, Canadian High Commissioner in London, if the remainder of No. 1 Tunnelling Company might be despatched to Gibraltar "as a matter of urgency". In view of the fact that a Canadian Tunnelling Company was required to remain in England for service with the main body of the Canadian Corps, which had just been formed, General McNaughton decided that the best way to comply with the British request was to organize an additional Company for service on the Rock. There was no question of the utility and pressing nature of the work to be done, and Canadian miners were the best qualified by experience to carry it out. Accordingly, No. 2 Tunnelling Company, R.C.E., was organized under the command of Major C. B. North, D.S.O., M.C., (Vancouver), and despatched to Gibraltar early in March 1941. About half of the original Special Detachment was absorbed into No. 2 Company and the remainder subsequently returned to England. In May 1942 Major J. G. Tatham (Larder Lake) succeeded Major North as Officer Commanding the Company.

It should be remembered that the Canadians were not the first tunnellers to

serve upon the Rock during the present war; nor were they the only ones to do so. British Tunnelling Companies were there before them and have remained there. The Canadian contribution, substantial as it has been, is, nevertheless, only a part of the great work of securing the Rock against the possibility of assault, upon which British engineers have been and still are engaged. It might be noted, however, that the Canadians were the first to introduce diamond drilling to Gibraltar.

The Gort Hospital and Harley Street

The principal task for which Canadians were brought to Gibraltar was the carving out of a great subterranean hospital which, protected by the Rock itself, would be safe from any attack which the enemy might launch. After a false start in December, work began in earnest in March 1941 on the hospital which was named after Field-Marshal the Viscount Gort, V.C., former C.-in-C., B.E.F., 1939-40, and at this time Governor and Commander-in-Chief of Gibraltar. For nearly two years Canadian soldier miners from all parts of Canada drilled and blasted their way from the east to the west face of the Rock. Working with up-to-date machinery developed in the mines of the Dominion, the Canadians tore out great quantities of limestone; and gradually the dimly lit caverns and rocky tunnels became wards, operating rooms, storage compartments and living quarters.

The wards were the largest chambers, their dimensions being approximately two



A supply track built by Canadian Tunnellers at Gibraltar.

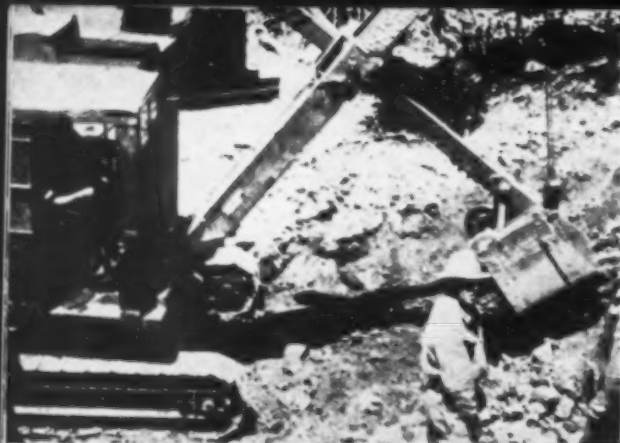
hundred feet by thirty-five by twelve. The floors were covered by concrete; walls and partitions with wall-board; and ceilings with corrugated iron. Owing to the geological nature of the Rock heavy timbering proved to be unnecessary. Safe from bombs, shells or gas, it is one of the most remarkable military hospitals in history.

Inside one of the chambers of the Gort Hospital



Monkey's Cave entrance to the underground workings in the Rock





Although it is the Gort Hospital by which the Canadians will be remembered, the subsequent extension of tunnels and chambers constituted a no less important feat of military engineering. The main tunnel, called Harley Street, after London's famous street where leading medical men have their offices, was approximately twelve hundred feet long by twelve feet wide and twelve feet high. Several chambers abut on this tunnel; while at one end a laundry was constructed which was actually the largest single chamber excavated by the Canadians at Gibraltar. Approximately eleven thousand tons of rock were removed from this room alone.

In addition to these major operations the Canadians were also employed at different periods on various other tasks such as excavating ammunition dumps and oil storage tanks inside the Rock, constructing pill-box fortifications such as Fort Canada and Fort Garry, heavy timbering, and finally in instructing the British tunnellers in the use of Canadian wet-drilling equipment. The British, few of whom had been hardrock miners of experience, were accustomed to using dry hand-held pluggers, a method of drilling generally regarded by the Canadians as "doing it the hard way".

Although difficulties of different kinds such as worn-out equipment, shortage of spare parts for the underground machines and compressors and the enervating climate of the late summer, tended at different periods to retard the speed of the work, it might be observed that during their two years on the Rock the Canadian Tunnellers mined and removed approximately 140,000 tons of solid rock. At the same time they expended 46,000 man hours on construction work. During the second half of 1942 the Special Detachment assisted the miners of No. 2 Company with their diamond drills with a consequent increase in the tonnage broken. From May to December 72,000 tons were mined and removed; a tonnage

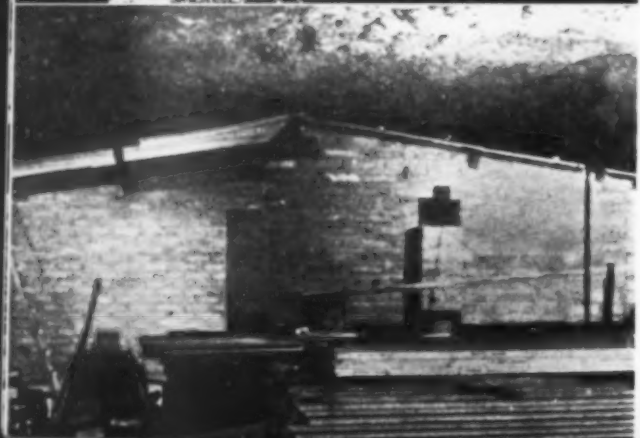
Top to bottom:—

A shovel operating in front of the entrance to Gort Hospital.

British troops on exercise pass Canadian Engineers engaged on construction work near Europa Point.

A portable compressor working in one of the underground chambers of the Gort Hospital.

Interior construction work inside the Gort Hospital



equal to more than half the total work done. The maximum weekly effort was attained during the week 13th—19th November 1942 when the Canadians averaged over 800 tons per day for a total of 4,832 tons excavated. This meant approximately 4 tons per man per shift, a figure which is in excess of those achieved by most of the larger mining companies of Canada.

The Invasion of North Africa

Although Gibraltar has, during the present war, faced nothing more than the occasional enemy air raid,—one of the most serious being the reprisal raid made by Vichy planes as an answer to the shelling of French warships at Oran,—the Rock has served as an important base for Allied naval and air operations. Past Gibraltar sailed the convoys to beleaguered Malta and beyond to Alexandria; upon Gibraltar was based Force H which sought out and destroyed the German battleship *Bismarck*; from Gibraltar sailed the famous carrier *Ark Royal* upon her last voyage in November 1941. These were the dark days of 1940 and '41. In the last two years Gibraltar has played an important part in the offensive operations which were designed not only to drive the Axis out of Africa but to bring victory and peace to an oppressed and war-weary world.

Although they were not at the time aware of the full significance of their work, Canadian engineers played an important, if inconspicuous part, in the preparations for the Anglo-American invasion of North Africa in November 1942. Not long after the return of the first Special Detachment to England, a request was sent by the War Office to Canadian Military Headquarters asking that a selected group of Canadian drillers might be sent to Gibraltar to assist a special project which involved "a large amount of quarrying". This project was the enlargement of airfield facilities by lengthening the existing runway, thus making it possible to be used by aircraft of the heaviest type.

Top to bottom:—

Men of No. 2 Canadian Tunnelling Company in front of a rock bin and loading chute built by the Company.

Dumping broken rock into the Mediterranean Sea.

One of the entrances to the Gort Hospital

Crushed rock on the way to the dump



Owing to the fact that this runway had of necessity to be extended into the sea it was proposed to obtain the fill from the scree at the base of the Rock.

Authority was obtained from Ottawa for the despatch of a second Special Detachment, and early in February 1942 Capt. H. W. DeMorest, proprietor of one of Canada's large diamond-drilling companies, arrived in Gibraltar in charge of a small detail numbering twenty-five other ranks from No. 1 Canadian Tunnelling Company.

Considerable difficulty was at first experienced in obtaining the necessary fill. The scree was too large for the shovels and various methods had to be tried to move it. Finally Capt. DeMorest adopted the method of hydraulicizing. This proved to be the solution. By means of water pressure it was possible to bring down large boulders from the face of the Rock and then to break them up by diamond drills and explosive charges. Henceforth hydraulicizing became the standard practice.

The runway was soon ready, and British and American aircraft of all sizes, types and descriptions were able to make use of the airfield at Gibraltar. Not only was the Rock Great Britain's strongest naval base; it is now an air base of in-

estimable value to the United Nations fighting in the Mediterranean theatre of war. During the early days of November, the Canadian Tunnellers witnessed the gathering at Gibraltar of a great armada of battleships, troop transports and planes. On the 8th they learned the real meaning of these preparations. Over the radio came the news that the British and American troops had landed in Algeria and Morocco. It was a bold and decisive step. Within six months Axis resistance in Africa was at an end, and the Canadians had the satisfaction of feeling that they had, in their own way, shared in making victory possible.

Life on the Rock

Despite the fact that oranges, bananas and other fruits not obtainable in Great Britain in war time, are readily available to the troops stationed on the Rock, Gibraltar is not regarded generally as a popular station. The whole area of the colony is small and facilities for recreation are, in consequence, limited. There is, moreover, no civilian society. The native population has been evacuated, and the Spaniards, who are employed or make their living peddling fruits and trinkets to the troops, are required to leave the colony by nine o'clock each night. Although day passes permit the men occasionally to visit La Linea or Algeciras, war conditions exclude the possibility of longer leaves to Spain and Morocco. Opportunities for action have been restricted to air raids. There is little, therefore, to relieve the monotony of service or to interest the soldier who has spent eight hours "mucking out" inside the Rock, except moving pictures, the Universal Bar or the Spanish band.

Military service under these conditions is scarcely heroic. After the novelty of Gibraltar with its different uniforms, many nationalities, strange sights, exotic smells and continental atmosphere had become commonplace, it was natural that the Canadian Tunnellers should find life on the Rock rather tedious and should exercise the immemorial privilege of the soldier to grumble at his lot. The hot humid weather of the summer known locally as the *Levanter*; the absence of female company;

One of the members of No. 2 Canadian Tunnelling Company



the constant appearance at meals of canned stew (M. & V.) or maconochie; and the irregularity and long delays in the delivery of mail from Canada constituted the usual burden of their complaints.

Life at Gibraltar, however, had some amenities. There was swimming in the clear blue water of the Mediterranean, soft ball on the Parade, trips at sea on trawlers and other vessels based on the Rock, and week-ends at the Governor's summer residence, which had been converted into a rest-camp. The coming and going of ships great and small—powerful battleships like the *Nelson*, *Rodney* and *Renown*, famous carriers like the *Ark Royal* and *Eagle*, little Canadian corvettes like the *Louisburg*, the first Canadian naval craft ever to enter Gibraltar,—were a source of perpetual interest to the Canadians.

The Canadians Leave Gibraltar

It had been expected that No. 2 Canadian Tunnelling Company would remain at Gibraltar only for a limited period. It was essential, as soon as its task was completed, that this unit should return to carry out its training as an integral part of the Canadian Army in England and be ready and fitted for its intended operational role against the enemy. This expectation was not, however, realized, and, as the months passed, the desire of the men to rejoin their comrades increased in intensity. This problem was fully appreciated both by the Canadian and British authorities; but the vital importance of the work on which the Canadians were engaged made it difficult if not impossible to relieve them at the date originally anticipated.



Finally it was agreed that when the Harley Street excavation was finished, further tunnelling operations could without difficulty be completed by the normal quota of British tunnellers stationed on the Rock. This definite undertaking buoyed up the spirits of the men and contributed to the increased tonnage output which was the outstanding feature of the latter part of 1942.

On the 5th of December the last shift was carried out underground and on the 14th the Canadian Tunnellers embarked for England. Before their departure the Governor, General Sir Frank Mason Mac-

Inside a workshop constructed by the Canadians in the interior of the Rock of Gibraltar.





Farlane, issued a special Order of the Day in which he paid tribute to "the admirable work performed by Major Tatham, the officers, N.C.O's., and men of the Royal Canadian Engineer Tunnelling personnel during their tour of duty at Gibraltar from 1940 to 1942". In his farewell speech he said:

"On behalf of all of us I want to wish God speed and good luck to our Canadian Tunnellers, who are leaving us shortly. They are the only Dominion troops we have had on the Rock, and like all our tunnelling units they have carved out a monument for themselves which will stand as long as the Rock

The Gibraltar Key which was presented to Canadian Tunnellers who served at Gibraltar.

Below: — General McNaughton presents a Gibraltar Key to Sapper A. Benoit (Kirkland Lake), No. 1 Canadian Tunnelling Company.





Lt.-Col. C. A. Campbell receives a Gibraltar Key from General McNaughton.



Three Canadian Officers at the presentation of the "Keys"; Brig. J. L. Melville (Ottawa), Maj.-Gen. C. S. L. Hertzberg (Toronto), and Lt.-Col. C. A. Campbell (Sault Ste. Marie)

remains. They have done a great job of work and we wish them all good fortune and good sound rock wherever they may go.

As a reward for their achievement it was suggested in August 1942 that the Canadian Tunnellers might be given some special mark of distinction. The first proposal was to grant them the privilege of wearing the Gibraltar Key in the form of a cloth badge on the right sleeve. It was not considered desirable, however, to establish the principle that Units serving detached might be given such special distinction; and a silver watch fob was substituted for the cloth badge.

The fob was designed by Sapper R. J. Cunningham of No. 2 Canadian Tunnelling Company. It consisted of a silver medal superimposed upon the Gibraltar Key. On the face of the medal was the figure of a miner against the background of the Rock with the caption "Gibraltar 1941-1942". Beneath the medal was a scroll containing the words "Royal Canadian Engineers". The choice of symbols was, in every respect, a happy one. Not only was Gibraltar christened the "Key to the Spanish Dominions" by Ferdinand and Isabella; but the Key has been for centuries part of the official Coat of Arms. The ceremony of handing over the keys at the changing of the guard has been carried out by various regiments of the garrison since the days of the Great Siege.

Owing to the fact that the presentation of the souvenir fobs was entirely of an unofficial nature the cost of their production was borne by James Y. Murdock, Esq.,

President of Noranda Mines Ltd., and head of the War Time Mining Association which had helped to finance the original Special Section. The keys were minted in Canada and on 27th March 1943 all officers and men entitled to do so received them personally from the hands of the G.O.C.-in-C., First Canadian Army.

The Gibraltar Tunnellers were the first Canadian soldiers to serve in the Mediterranean area in the present war; they were far from being the last. As they were returning to England, other Canadians were going out to the same theatre of war to fight in North Africa with the First Army. More lately powerful Canadian forces have fought in Sicily and on the mainland of Italy as part of the Eighth Army. The part played by these forces in the recent great Allied victories will be a source of pride to the Dominion in years to come. One of the chief foundations of those victories was the fortress of Gibraltar; and to the security of that fortress the energy and skill of Canadian miners serving in the ranks of the Royal Canadian Engineers made no small contribution in the days of 1941-42.

Note on the Illustrations

Some of the photographs with which this article is illustrated are British and Canadian Official Military Photographs. Others are photographs taken by members of the Canadian Tunnelling units at Gibraltar. The drawings are the work of and reproduced with the permission of Spr. R. J. Cunningham, R.C.E.



Booms and lumber yards, Sillery Cove, Quebec, 1878

Photo by J. E. Livernois

FORESTRY IN QUEBEC

PAST—PRESENT—FUTURE*

by AVILA BÉDARD

GAZING at the mass of trees bristling on the slopes and summits of the Laurentians, one's imagination is carried back to the days when the forest mantle, like a vast verdant sea, covered nearly all of what is now Quebec. This immense forest, on the margin of which Cartier planted a cross of native wood as a sign of possession for France, was destined to witness some of the most glorious epics in our history and to become a source of wealth little dreamed of at that time.

To the early pioneers, the forest was full of terrors, an enemy rather than a friend. In its deep thickets, under its almost uninterrupted leaf canopy, lurked enemies whose frequent and unexpected inroads were a constant menace to the settlers. Lescarbot wrote: "We must fight and fell the forest". The Royal Commissary Dupont stated: "It would be worth while to enquire into the advisability of burning down part of the woods to put a stop to the depredations of the Iroquois".

*Photos, where not otherwise credited, by J. W. Michaud, by courtesy of the Dept. of Lands and Forests, Quebec.



A few far-seeing men realized the potential value of the forest cover. Champlain marvelled at its density. Boucher and Catalogne described at length its various and valuable trees, and Charlevoix ranked it among the worthiest in the world. Talon wrote to the King that he expected "that this country can supply His Majesty with

what they need, should the forests of France prove insufficient", and added—"I will do my best so that this country in the future will be in a position to provide the timbers which His Majesty is obliged to secure from the Kingdoms of the Baltic Sea".

To the settler desiring only to secure land for farming purposes, however, trees were obstacles of which the value was either minimized or ignored. Wood was worth only the trouble to cut it. True, the forest, as the habitat of fur-bearing animals, served the fur traders, and was appreciated in a certain measure as a source of firewood and lumber, but it was not estimated at its proper value, or considered as a natural wealth apt to contribute to the development and welfare of the country.

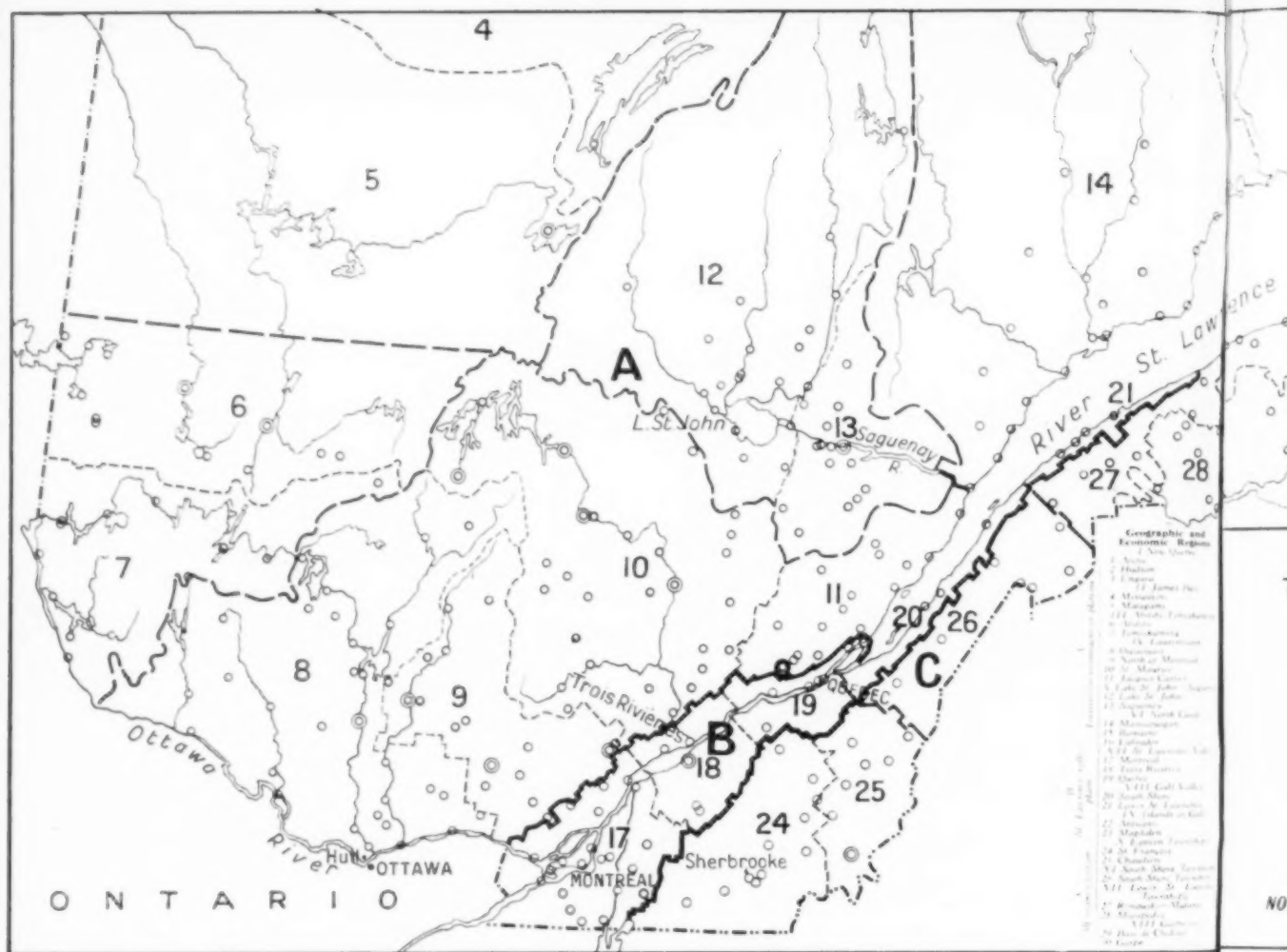
Economic Importance of the Forest Industry

In contrast to this early view, the forests of Quebec have to-day become one of the outstanding sources of wealth in Canada. Annual exploitation averages not less than 750 million cubic feet of timber. This represents, including operations of cutting, hauling and driving, 7,300,000 man-days of labour, while its transformation into manufactured products involves, annually, another 6,800,000 man-days of labour. Thus, leaving out of account the work of technicians, managers, superintendents, administration staffs, overseers, clerks and contractors, forest operations alone provide work on a yearly basis for some 50,000 men. Taking into account all personnel as well as workers engaged in navigation and in rail and truck transport to the markets, Quebec's forest industry is capable of giving employment to approximately 100,000 persons. It has been estimated that this industry pays

Square timber yard, Sillery Cove, 1878

Photo by J. E. Livernois





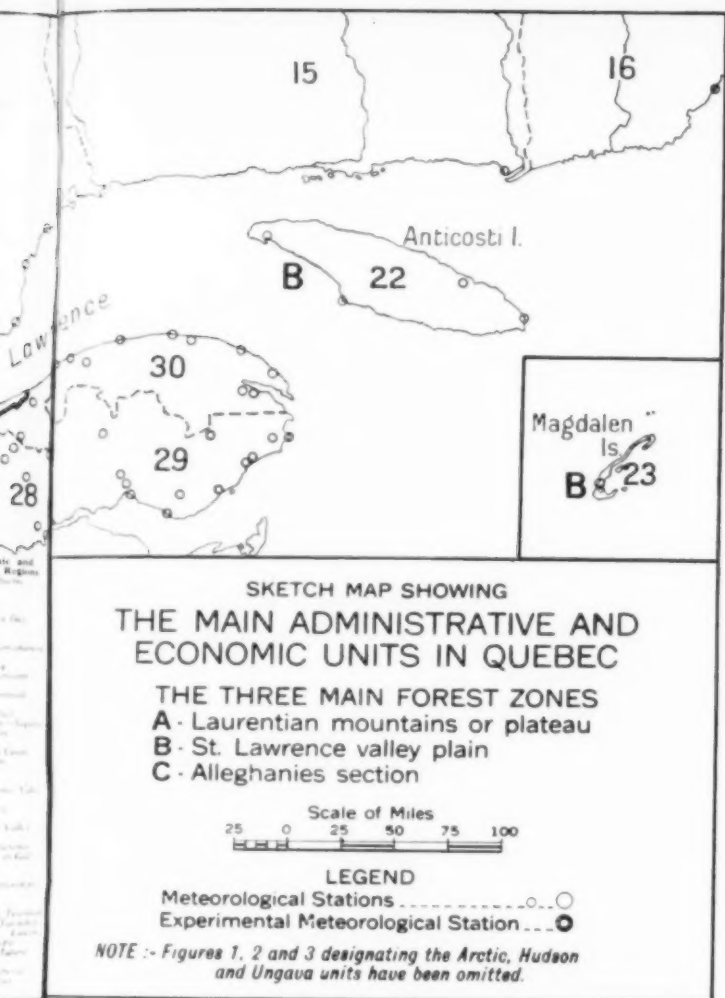
annually \$48 million in salaries and wages, and provides a livelihood for close to half a million people.

In recent years the gross value of production of the Quebec pulp and paper mills averaged \$60 million per annum; that of sawmills about \$20 million; that of other wood-using industries about \$14 million. In 1939, production was even above these levels. The total value of the forest production in Quebec amounted to \$177 million. It ranked next to agriculture, the gross value of which amounted to \$208 million, and ahead of mining production, construction and the Hydro-Electric industry, which had gross values of production amounting to \$163 million, \$119 million and \$56 million, respectively.

In yet another sense the forest contributes to the welfare of the community. It provides markets for the products in other fields of endeavour. Thus, the

agricultural industry sells some \$2½ million worth of its products annually in markets opened and maintained by forest operations. Moreover, the forest provides numerous farm workers with work at a time when agriculture cannot use their services. In many instances it has ensured the survival of colonies that have risked their existence on poor soils, offering outlets to their products, and employment to their inhabitants. In short, the forest is a valuable auxiliary for agriculture.

It should be mentioned also that the pulp and paper industry, which owes its existence to the raw material of the forest, is, in net value of products, in capital invested, and in wages and salaries paid, the most important manufacturing industry in the Province of Quebec. In 1940 there were 10 pulp mills, 10 paper mills, and 26 pulp and paper mills. The capital invested in this industry amounted to



\$338,424,650, and the gross value of its products was estimated at \$151,264,649.

General Description of the Forest

The commercial forests of the Province of Quebec extend from the 52° of latitude north, between the Labrador frontier to the east and the basin of the East Main River tributary of James Bay to the west, to the frontiers of New Brunswick and the United States to the south. In a broad sense the forest zones of Quebec may be demarcated and discussed in three divisions.

Plain Zone

The fertile alluviums, forming terraces on either side of the St. Lawrence at different heights, constitute a sort of plain which attains its greatest expansion in the Montreal region. Below Quebec on the north shore, this plain narrows

down until it disappears completely below St. Joachim. It indentates, here and there, north of the St. Lawrence, more or less deeply, whereas, on the south shore, it retains its width fairly well as far as the Matapedia Valley, where it expands obliquely down to Chaleur Bay. Here and there a few scattered mounts, such as at Kamouraska and L'Islet, break the monotony of a level landscape and colour the picture, resembling the classical Monads.

The land of this plain was the first to be divided into seigniories and subdivided into farm lots. On it the pioneer first spent his efforts and colonization wrote its real saga. Agriculture progressed in a most remarkable and persistent manner as the many church steeples and the populated parishes surrounding attest. The remarkable progress of settlement inevitably reduced the area and broke up the continuity of the forest. The forest is formed of clusters or groves, although, here and there, within the boundaries of the old seigniorial concessions, important wooded areas are still to be found. Save in the latter, the hardwood stands predominate. Yellow birch, maple, basswood, ash, some oak and butternut are the most frequent tree species. The softwood stands are made up of spruce, balsam fir and hemlock; pine being rather scarce.

The small forest industry is widespread; especially that devoted to manufacturing products other than lumber. Important sawmills and pulp and paper plants are to be found, but they derive their raw material from the real forest regions of the country; that is to say, from the Laurentide and Appalachian regions.

The maple sugar industry is systematically organized and consolidated for the benefit of the far-sighted farmers. In this plains-sector, a relatively long summer and abundant precipitation, adequately distributed, favour the rapid growth of trees and account for their diversity. Moreover, these conditions invite, so to speak, the forest to reconquer the less fertile soil from which it was unwisely banished.

This zone extends, without greatly changing aspect, back into the bordering mountainous regions through the gaps in the landscape, corresponding with Lake Temiscouata, Chaudiere, Saint-Francis, Ottawa, Gatineau, Lievre, St. Maurice and Jacques-Cartier Valleys, to cite the most important sectors.

Notre Dame Mountains Zone

To the southeast of the St. Lawrence Valley and paralleling it is a belt of upland country known as the Notre Dame Mountains. This forms part of a major physiographic division, the Appalachian Highlands, which stretches from the south-eastern United States to Newfoundland. The northeastern extension of the Notre Dame Range in Gaspé Peninsula is commonly called the Shickshock Mountains, a series of broad flat-topped summits bordered on either side by wooded plateau country, and the whole traversed by deep, steep-sided valleys.

The soil in this zone is not entirely occupied by the forest. Numerous parishes and colonies of settlers in process of development break the apparent monotony of the timber stands.

From the Chaudière Valley to the extreme point of Gaspé, the forest contains a large percentage of softwoods, whilst west of this valley, save in the Lake Mégantic region, hardwoods predominate and reproduce as forest types some of the characteristics noted in the western part of the central plains.

Along the course of the Notre Dame Mountains towards the point of Gaspé, the softwoods most frequently met with are spruce and balsam fir, for which on special sites cedar is substituted and which, close to the American border, give way to aspen, white birch and maple and yellow birch stands. From the Matapédia Valley to the Gaspé timbered plateaux and mountains, the dark green tint of the coniferous stands is brightened by the clear green foliage of numerous white birch stands.

The soil in this zone, whilst of better quality and better adapted to farming than that of the Laurentian region, is, nevertheless, as a general rule, over a wide area, especially favourable for the growth and maintenance of timber. The scarcity of lakes to feed the water courses and regulate their flow necessitates the presence of the forest. The latter finds in this region ideal climatic and soil conditions for its development.

Many active and prosperous sawmills are established in this zone, and, if important pulp and paper mills were not erected within its boundaries or close to them, it

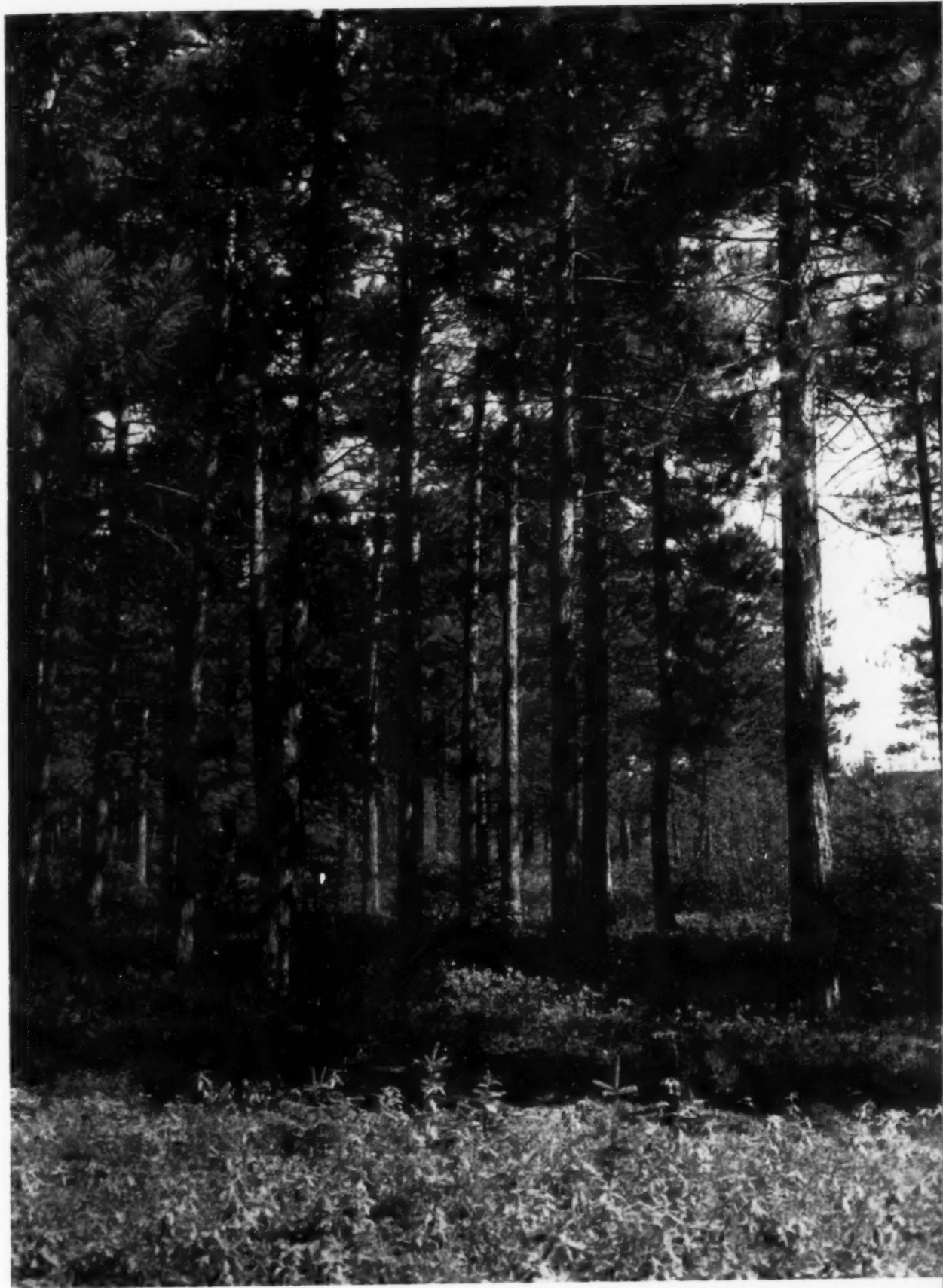
was due to the fact that the rivers which traverse it cannot develop sufficient water power. With the exception of a few small timber-parcels preserved as township forest, at the disposal of farmers for obtaining their firewood and lumber, the area is, for the most part, leased to sawmill operators, pulp and paper plants, or lumber dealers. Nevertheless, farmers and settlers own an important part of this timber wealth. It is, therefore, divided in lots of varying dimensions which furnish pulpwood to supply some American plants or mills.

Laurentian Zone

There remains the Laurentides zone, consisting, on the whole, of a series of mountains, giving the appearance of an immense plateau capriciously chiselled. It resembles a vast sea of crystalline rock, gneiss, granites and schists, the immense waves of which invite in their troughs numerous lakes of different sizes to display their irregular contours, and also swift rivers to course a hazardous way.

In the southwest portion and in the neighbourhood of Temiscamingue Lake, the forest reproduces, in the variety of its species, practically the same characteristics as the western section of the Alleghenies.

From the Saguenay to the Ontario border the white pine for a long time ranked first amongst the tree species for commerce and industry. Intensively exploited during the past century, the white pine receded toward the height of land, where the Ottawa, Gatineau, Lièvre and Rouge Rivers take their source, leaving clearings where some hardwoods and some conifers, particularly spruce and balsam, could freely regenerate and multiply. The latter are usually associated, although spruce has a tendency to form pure stands by itself. These two species share the immense Laurentian territory, sometimes in stands of even age, other times through uneven-aged colonies, invaded here and there by yellow birch and certain varieties of maple. These stands are often limited in importance and size by the interposition, here and there, of white birch and aspen colonies which have sprung up along the transcontinental railway and in the Lake St. John region, to mention only the more



A red pine stand, Temiscouats County



Forest exploitation camps, Estcourt

accessible ones. These intolerant hardwoods occur where fire has reduced to ashes the primitive spruce and balsam stands. The importance and size of the spruce and balsam stands is also affected by the presence of pure stands of jack or red pine, such as are met in the Abitibi and the St. Maurice regions.

This forest—whose products, owing to the numerous tributaries of the St. Lawrence traversing it, can easily be brought to the mills or markets—is relatively well wooded. It can supply precisely the timber best adapted to the manufacture of pulp and paper. Several mills obtain their supply of wood in this sector.

Towards the Atlantic, one penetrates into that part of the Labradorean peninsula known as the North Shore, where the forest stands are less diversified. They are composed of smaller trees and mostly confined to the valleys and flats, being replaced on the summits of the mountains by humble xerophilous plants, and often giving way to muskegs carpeted with mosses, adorned with ericaceae and sparingly dotted with black spruce and larch trees.

The forest conditions of the Labrador plateau prevail as far as the James and

Ungava Bays, but are modified to a great extent. Although the 52nd parallel is the northern limit of the accessible wooded area of commercial value, the forest continuously deteriorates as it develops northward from the 51st parallel. From a physiographical viewpoint very little change is noticeable—the same plateau composed of Precambrian rocks, largely granite. Spacious depressions in the northern part are converted into bogs or muskegs, where mosses and lichens predominate, and, toward the south, are covered by very open stands of spruce and balsam trees of small size. White birch and aspen and willows of scrubby appearance bristle up in this primitive landscape. Farther to the south the black and white spruce occupy the valleys, though they may sometimes hazard themselves on the summits, which, however, are usually invaded by an alpine vegetation, whenever the quality of the soil and the climatic conditions prevent the arborescent flora of the zone previously described from implanting itself.

The 56th parallel just about delineates the northern boundary of the tree kingdom. Even at that it must be remembered that,

being north of the temperate zone, the trees are stunted, of tardy growth, and appear to have accomplished but one mission, that of adorning an otherwise very ugly country.

Classification of Forests according to their Tenure

The forests which, owing to their geographical situation, have been put or are being put to use, can be divided into two important categories; that is, the private forests and the Crown forests.

The privately owned forests, which include those belonging to the seigniories, those growing on patented lots or lands granted as subsidies, and those constituting the wooded parcels of lots under location tickets, cover a total area of 26,580 square miles. The Crown lands cover a total area of 235,443 square miles, which are divided for administrative purposes into leased timber berths (75,293 square miles); township forest reserves (2,169 square miles); domanial forests (2,292 square miles); forests known as Crown lands, vacant and free from any encumbrance (154,479 square miles); federal owned lands for Indian reserve and military camps (277 square miles); forests on disponible lots for colonization (1,000 square miles); and sundries (210 square miles).

To complete this sketch, there is given, on page 268, some statistical data compiled from forest reconnaissance and inventories.

Laws and Regulations Concerning Lands and Forests

Provincial statutes deal with the sale and disposal of Crown lands, the lease of timber berths, timber culling operations, the scaling of wood cut, the collection of stumpage dues, silviculture and forest management, as well as inventory methods, reforestation and forest protection. These laws relative to lands and forests may be found in Chapters 92-97, inclusive, of the *Quebec Revised Statutes of 1941*.

The lands reserved for forest industries are administered by the Department of Lands and Forests, the technical part, such as inventory, reforestation, superintendence of cutting and control of culling, being in charge of the Forestry Service. The limits are leased by auction after public notice has been given. The lease-holder has the exclusive privilege of cutting timber on a specified area of the

domain. The price of this license, fixed by auction, is payable in three instalments, the first cash, the second at the end of a year and the last after two years, bearing interest at 6 per cent. The Government reserves the right to dispose of the water powers situated on the limits leased, together with the ground required for their development. In certain cases, the stumpage dues instead of the adjudication premiums are fixed by auction, the bidder agreeing to pay, besides the tariff in force for stumpage dues, an additional amount varying according to circumstances. The Minister may have a survey made of the limits at the expense of the purchaser, the cost of this being payable in the same manner as the lease of the limit. The lease-holder binds himself to erect, within a specified time, a pulp or a paper mill and a power plant of sufficient capacity for its operation. The lease of water powers is subject to certain conditions (a long term lease, annual rent and royalty). Every intending lessee must deposit a certain sum of money with the Department of Lands and Forests. This deposit is confiscated if the depositor does not bid at the time of the auction or refuses to sign a contract or does not conform thereto. The license is for one year and is renewable, provided the holder has complied with the conditions imposed; it is a negotiable security and can be transferred with the authorization of the Minister of Lands and Forests on payment of a fee of \$60.00 per square mile. The lessee of a limit must also pay, over and above the amount fixed by auction, an annual ground rent of \$8.00 per square mile. He must also transmit a statement, before the month of December, of his intended operations together with the number of his employees and the location where the cutting is to be done. The wood cut must be measured by a licensed culler. At the end of the operations the limit-holder must produce a sworn statement of the quantities cut. Stumpage dues must be paid before the first of December.

"If, for any special reasons, it becomes necessary to authorize the exploitation of non-managed forests, the volume of the cuts there is limited to an empirical possibility fixed by the Minister, and it is permitted to cut there only trees of twelve inches (12") and over in diameter, except spruce, balsam and Jack pine which may be cut to ten inches (10"), paper birch, poplar and aspen which may be cut to



seven inches (7") in diameter, measured one foot from the ground."

The cutting permit carries in certain cases an obligation to restrict cutting to less than the annual forest yield. Reserves thus created are provided to meet urgent emergency needs of the industry or to cope with abnormal situations arising from forest fires, or damages by insects, diseases or wind-falls. Before any cutting operations take place, the Minister of Lands and Forests must be provided, three months in advance, with a well-defined cutting programme showing the area to be cut over and the volume of wood to be exploited.

As a rule, no cutting, except for thinning,

is allowed in stands that have not yet reached maturity, and in regard to working-plans, the technicians of the Department (forest engineers) suggest the appropriate silvicultural methods to be used.

It is also ruled that the limitholder must first, whenever economically feasible, exploit those stands which have depreciated in value or been damaged by windfalls, insects, diseases and fire. In respect of the latter a special stumpage due has been set up below the regular rate, but varying from year to year down to a 70 per cent reduction proportioned to the number of years which have elapsed from the date of the forest fire. This is to induce the licensee



Loading logs on sleighs, Estcourt.

The use of forest operation methods must not interfere with the health conditions of the forest workers nor impair their physical fitness. They are therefore governed by special regulations set forth by the Minimum Wage Commission.

In some cases, particularly inside the forests forming part of the Provincial Parks, no cutting is to take place within a zone of 200 feet in depth on the border of lakes and rivers and along the main roads, in order to preserve the scenic beauties.

Logs must be properly piled along the roads and rivers so that they can be readily scaled. Since 1936 they have been measured according to their cubic contents, the f.b.m. unit having been discarded, even for scaling saw-logs. This modification has been brought about to ensure to the Crown its proper and total share of revenues in the form of stumpage dues, whatever the ultimate use of the timber cut, and to have the figures of the exploitation fit those of the forest inventory.

On the lands which have been classified by forest engineers and agronomists of the Department of Colonization as unfit for agriculture, the Government can establish (in virtue of articles 105, 106, 107, chap. 93, *Quebec Revised Statutes, 1941*), by Order-in-Council, permanent forest reserves. The creation of such reserves, which contribute to ensure a greater stability to the industry, is generally sanctioned by a contract between the parties concerned.

to fell burnt timber as early as possible, before it becomes a total loss for him and the province. Cutting must be carried on in such a manner as to preserve the young growth which will form the future forest. This means that certain hauling or transport practices cannot be tolerated.

On the other hand, logging roads must be kept at a minimum both in width and number, so as not to encroach too much on the forest capital and to leave standing a sufficient number of seed-trees which, grouped together, will resist the wind action and achieve their task.

Piling logs, Estcourt.



CLASSIFICATION OF QUEBEC LANDS

	Age	Accessible S.M.	Inaccessible S.M.	Total S.M.
<i>Productive forest lands</i>				
Softwood merchantable	(41 +)	63,250	135,245	198,495
Young stands	(1 — 40)	18,203	27,250	45,453
Mixed merchantable	(41 +)	20,300	4,138	24,438
Young stands	(1 — 40)	16,057	4,415	20,472
Hardwoods merchantable	(41 +)	2,829	—	2,829
Young stands	(1 — 40)	5,644	—	5,644
Total productive area		126,283	171,048	297,331
Non-productive forest lands		—	67,484	67,484
<i>Non-forest lands</i>				
Agricultural lands		22,000	—	22,000
Denuded and waste area		3,846	132,873	136,719
Water		15,786	55,214	71,000
Total area		167,915	426,619	594,534

ESTIMATES OF COMMERCIAL TIMBER

	<i>Lumber</i>		<i>Pulpwood-firewood, etc.</i>	
	10 inches D.B.H. and more Accessible 1,000 ft. b.m.	Inaccessible 1,000 ft. b.m.	4-9 inches D.B.H. Accessible 1,000 cords	Inaccessible 1,000 cords
Spruce	24,201,065	8,084,759	262,355	251,042
White Pine	1,183,912	—	8,385	—
Red Pine	236,782	—	2,177	—
Jack Pine	1,826,882	19,962	39,599	449
Larch	25,259	—	502	—
Balsam	12,962,329	4,738,567	133,411	154,336
Hemlock	71,900	—	1,048	—
Cedar	608,724	—	5,872	—
Other softwoods	—	—	—	—
Total softwoods	41,116,893	12,843,288	453,349	405,827
Birch yellow	3,921,068	—	27,047	—
Birch	5,755,906	519,822	100,007	41,460
Maple	1,448,838	—	8,452	—
Beech	369,475	—	10,728	—
Basswood	125,000	—	2,500	—
Ash	150,000	—	4,087	—
Elm	100,000	—	1,875	—
Poplar	2,500,000	39,925	21,181	898
Oak	5,000	—	25	—
Other hardwoods	20,000	—	225	—
Total hardwoods	14,395,287	559,747	176,127	42,358
Total of all species	55,512,140	13,403,035	629,476	448,185

Forest Service and Its Achievements

The timber lands in Quebec are administered by the Forest Service of the Department of Lands and Forests. Created in 1909, its powers include classification of land, disposal of timber, and regulation of cutting operations. Since 1924 forest protection has been under a separate organization—the Forest Protection Service.

The Forest Service succeeded the Woods and Forests Branch, which had rendered good service but was unable to cope with the new situation arising from the importance of the developing pulp and paper industry, because it lacked the necessary funds and adequate staff both in number and training.

Moreover, the forest resources of the country insufficiently known or incom-

pletely cruised, or explored in a too broad manner, were exploited more in relation to the immediate requirements of industry and commerce than in relation to real exigencies, as recognized from a sylvicultural standpoint.

Prior to the creation of the Forestry Service, the lumber industry was in the forefront and exploitation of forest wealth was mainly limited to trees of large diameter and certain selected species. It did not encroach upon the forest as does the pulp and paper industry. It entailed, however, the leaving on the forest floor of a large amount of refuse which constituted a fire hazard, all the greater since the protection service possessed limited means for preventing and fighting forest fires, and, since colonization followed no set

rules in its development, resorting to an unwise and unregulated use of fire for clearing purposes. Nevertheless, wherever fire could be eliminated, the forest was capable of regenerating itself in a relatively short time and of offering the operator, after a short period of rest, a fairly abundant crop. Forest operations were then principally carried out in the most accessible regions.

Since its creation, the Forest Service has had various and numerous and important tasks to accomplish. The Chief of the Forest Service has the aid of highly trained personnel, including such officers as technical adviser, administrative inspector, general inspector of forest operations. In all, the Forest Service comprises 100 employees at the main office, and 700 for exterior service. Some of the latter work only during the season of cutting operations, while others are engaged during the summer months in forest inventory, nursery and reforestation work.

The province has been divided into ten districts for administrative purposes. At the head of each of these units is a forest engineer, assisted by one or more forest engineers, depending upon the importance of operations carried out and the variety of silvicultural work to be accomplished in his district. Such territorial subdivisions are necessary to achieve adequate control of operations over an area of 75,293 square miles of leased forests, of 2,169 square miles of township reserves, 2,292 square miles of domanial reserves, and 154,479 square miles of vacant Crown lands.

Limitholders are obliged by law to make an inventory of their limits. This obligation has resulted in the recruitment of forest engineers with appropriate training and knowledge, and in making better known the resources apt to provide industries and commerce with an essential raw material. It has emphasized the necessity of making use of these resources according to scientific methods.

At present, the forest working-plans prepared in conformity with section 69, chapter 93 of the Lands and Forests Act (*Quebec Revised Statutes, 1941*) apply to 39,807 square miles. Other working-plans are under study or are being revised or in preparation, while some, however, are out of date. It can be said, all considered, that 55,247 square miles of leased forests are more or less governed by the provisions of a working-plan. There is yet to be

prepared working-plans for 18,053 square miles of timber limits.

It may be added that the Bureau of Forest Economy keeps, in its archives, inventory reports covering an area of over 93,000 square miles, of which 56,000 square miles are the achievement of limitholders' engineers.

Apart from the leased lands there are township reserves and domanial forest reserves, as already indicated. The former have existed since 1911. They serve to furnish settlers and farmers with building material, and firewood, which they cannot obtain on their land or farms. The cutting of this material is subject to special regulations, among which is a restriction on the total volume of cutting to the yield of the forest itself, and another which prohibits the sale of the wood thus cut. These township reserves—the total area of which is 2,169 square miles—number 166, are distributed in 26 counties, the most important being in the counties of Abitibi, Chicoutimi, Laviolette, L'Islet, Roberval and Saguenay. During the year 1943 they yielded 2,556,339 cubic feet. The wood cut is subject to special stumpage dues, higher than those fixed for timber cut within the leased forests, and meant to cover the cost of delimitating the cutting areas, supervising the exploitation and scaling of the wood cut.

The domanial reserves are forests that may be exploited under the direction of the forest service, either under control or under contract, in order to supply certain essential industries with the raw material which their timber concessions cannot supply. They are situated at the head of certain rivers in regions not easily accessible to small industries and where the building



Handling logs on the Chaudiere River, Breakeyville.



Hauling booms, North Shore of the St. Lawrence.

of costly roads would be necessary to facilitate their exploitation. So far these reserves, covering an area of 2,292 square miles, have not been utilized.

Those who wish to obtain wood for commercial and industrial purposes (e.g. small sawmill owners or small pulpwood dealers, as well as certain mine owners), may obtain a permit to cut a quantity varying between 150,000 and 300,000 cubic feet. However, a permit for more than 150,000 cubic feet is granted only to industrialists whose sawmills, plants or workshops are considered an economic essential factor for a neighbouring locality.

Special cutting permits were granted during the year 1943 for a total volume of 9,536,551 cubic feet. They have become more and more numerous and have enabled industry to cope with the new demands and urgent needs of timber arising from the present war. The wood cut under these permits is subject to a special tariff which supersedes the one prevailing in the case of forest operations inside the timber limits.

The privately owned forests, with an area of 26,580 square miles, do their share toward the prosperity of the lumber trade, and even to the pulp and paper industry. In fact, according to the statistics for the year 1942, they have supplied the latter with 1,505,227 cords as against

3,884,703 cords cut on the leased Crown lands.

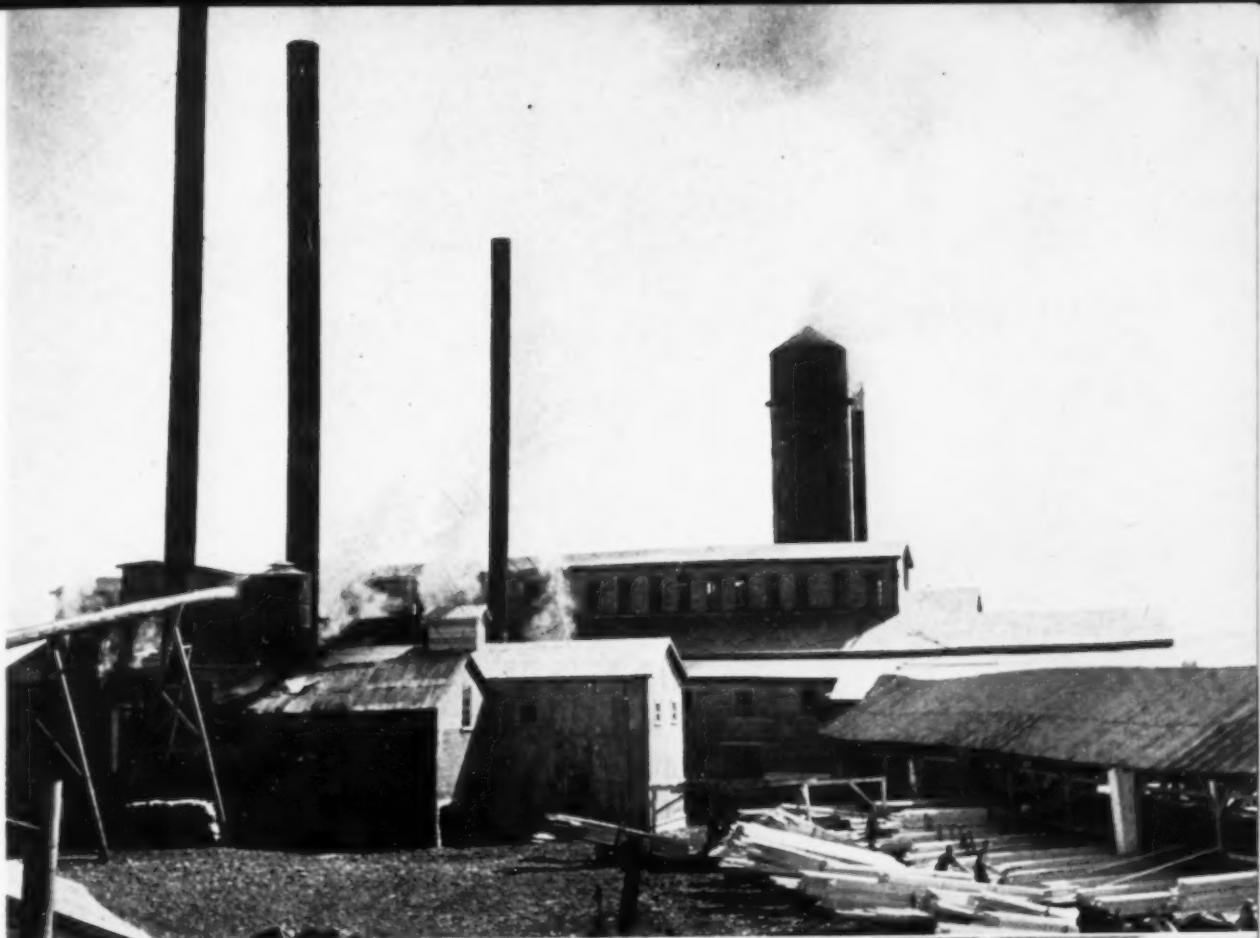
These privately owned forests derive their importance, as a source of raw material, from their being situated, for the greater part, in regions where the rate of tree growth is comparatively high, in regions where small industry, comprising some 2,000 sawmills, is very active and where the forest is most accessible. Nevertheless, the intensity of the cuttings tends to impoverish these private forests.

Forest Information Bureau

In order to promote a better conception of the utility and importance of the forest and its conservation, a special organization, called the Forest Information Bureau, was created in 1942, in conformity with the recommendations of the forest engineers, and the suggestions both of the Quebec Forest Association and of certain well-informed farmers. This organization diffuses silvicultural information with the object of proving to the rural population the services which the forest renders, and showing the method of treating such a natural resource in order to conserve its possibilities.

Top right:—Sawmill at Cabano, Temiscouata County

Bottom right:—A small sawmill, Temiscouata County





Log driving on the St. Maurice River

C. N. R. Photo



Forest Fires and Forest Protection Service

Fires which have played such havoc in the forest of this country and, at the same time, helped colonization to settle and progress, are not a recent phenomenon only. In days gone by forests did not escape such conflagrations as impressed so deeply the population some twenty years ago. The *Jesuits' Relations* gives an interesting and amazing picture of fire spreading through vast wooded areas of the seventeenth century. This is particularly true of the *Relation* written by Father Lejeune in 1660.

The Chevalier de Troyes in the diary of his journey to the Hudson Bay in 1686, describes a forest fire which, under his very eye, had spread over the country he was going through.

The forest fire of 1870, the most considerable in recent history, laid waste

The log pile, Donnacona



Booms on the Jacques-Cartier River, Donnacona

the greater part of the more accessible Lake St. John forests.

Thus quotations borrowed from annalists or memorialists of the French regime and from those of a more recent period, fortify opinion as to the frequency and recurrence of the forest fires, even at the outset of the colonial enterprise. Truly enough, such conflagrations do not invite optimism, but they should not generate an exaggerated pessimism—the places where fire has erased the forest for all time being very scarce. There are a great number of sites where the forest has been able to regenerate itself after great fires, as is proven by the forest operations which are being or have been carried thereon.

It appears that there are no reasons to underestimate the recuperation power of the forest, even if it should be momentarily handicapped or diminished by fire.

In 1869 the Parliament of Quebec enacted a law to establish the responsibilities in cases of fire, and, in 1870, defined the preventive and adequate measures to be resorted to for slash burning, and precautions to be taken when circulating or sojourning in the forest without exposing

the latter to the dangers of a partial or complete destruction by fire.

This law was the basis of all the Quebec legislation concerning the protection of the forest against fire. Like all laws, it underwent, through the years, many modifications appropriate to new conditions brought about by the development of forest industries using up more and more wood.

In 1883, every timbered region was placed under the direct control of the State as a protected region. The law which thus established a safeguard of the forest provided for the engagement of a well trained personnel and for the appointment of a general superintendent of forest fires, at the disposal of whom the limitholders must put the number of men he may need to work under his instructions and guidance. The limitholders are also obliged to pay the lodging, board, travelling expenses and wages of these employees. In 1912, after realizing that better results could be secured through co-operation of all the limitholders operating in the same territory, the first association capable of protecting more efficaciously the forest

A lumber yard, Estcourt





One of the many attractive buildings of the Quebec Forest Rangers' School at Duchesnay

against fire was incorporated. This first was the St. Maurice Forest Protective Association. Then came in 1914 the Lower Ottawa Forest Protective Association, which, in 1917, changed its name to that of the Ottawa River Forest Protective Association.

In 1917, the St. Lawrence Forest Protective Association and the Laurentian Forest Protective Association were created. All these associations with a well trained personnel, guided by men of experience, have largely contributed to protect from fire very important areas of our timbered domain.

Since 1919 the limitholders must have their limits patrolled by forest-rangers whom they choose and pay, but whose appointment must be approved by the Department of Lands and Forests. They must outline their programme of action for the summer months or dry season every year for approval, and regularly report on the work and activity of the personnel engaged in the prevention and extinction of fires.

Before 1924 the forest service looked after the supervision of forest operations and the protection of the forest as well. After great conflagrations had taken place which reduced to cinders or impoverished important sections of our forests, a special

protection service was created. It was decided then that the privately owned forests, covering an area of more than 2,000 acres, would, at the discretion of the Minister of Lands and Forests, be subjected to the same obligations as were the limitholders themselves.

To-day the protection of forests against fires is assured by the service just mentioned, by six associations of limitholders and owners of private forests and by forty limitholders or large proprietors, acting individually.

The personnel of the various organizations mentioned above, devoted to this excessively important task, comprises 257 inspectors, 1,743 fire-rangers, 1,226 assistant-fire-rangers, who patrol a timbered area of 106,483,997 acres and who dispose of the necessary equipment and apparatus to permit 20,000 men to take part in fire fighting in the case of large conflagrations.

The protection service has 462 observation towers, installed in strategic points; 72 radio stations; 8,538 miles of telephone lines; 743 motor pumps; 1,108,488 feet of hose, not counting tools of all description such as axes, bill-hooks, water-bags, etc.

To add to the efficiency of prevention and forecast of fires, a forest meteorology bureau was established in 1936 after experimentation and observations had

shown close relation between the development of fire and certain climatic conditions.

Thanks to this Bureau, which has under its control 167 meteorological stations, distributed all through the province, the inflammability index of timbered areas can be established daily. This is done particularly in 99 stations, according to the Wright method, which consists in measuring with appropriate instruments the relative humidity of the air, the velocity of the wind and takes into account the condition and the composition of the forest stands. By means of tables giving empirical data it is possible to forecast with certain exactness the gravity of a fire which would develop in the timber stands of a particular region and consequently to take the adequate measures and methods for preventing and fighting the forest fires.

The tabulated data on page 277, are borrowed from an article on forest protection written by Mr. Georges Maheux (*Actualité Economique*, vol. 1, no. 3 — June-July, 1943).

Forest fires have been considerably reduced, thanks not only to the effectiveness of the personnel engaged in the defence of the forest, but also to the issuance of special burning permits (which may be discontinued for the period of dry weather). These permits not only give information as to the causes of fires, but also have proved illuminating as to the manner of dealing quickly with the situation, to combat and extinguish fires.

Reforestation and Forest Nurseries

It is generally preferable to let nature accomplish the task of reforestation or reseeding sectors cleared or denuded by cuttings, insects or fire. Nature is often incapable of fulfilling this task, however, and in any case does not always reproduce the desired species. It is necessary in such circumstances to resort to artificial means.

To provide facilities for this purpose the Government established in 1908 at Berthierville the first important tree nursery. Since its creation, it has been greatly enlarged and improved, as is clearly demonstrated by the number of buildings of every description, the equipment, the personnel attached to it and the number of trees which are yearly raised therein.

There were to be found in this nursery last year 8,600,000 seedlings belonging to some 149 species, 88 per cent of which were coniferous.

During the 1942-43 fiscal year, this Berthierville nursery supplied 1,832,565 seedlings for reforestation or ornamental plantation purposes, and some 100,000 small trees for the creation of wind-breaks, or the establishment of groves to stabilize sand dunes or prevent soil erosion.

Next in importance is the nursery of Proulx, organized many years ago by the Laurentide Paper Corporation. After the 1930 crisis it was taken care of by The Provincial Government up to 1935, when it became the property of the latter. There is to be found a stock of 5,123,514 seedlings which are raised mainly for reforestation purposes. In Gaspé, at New Carlisle, was established in 1940 a relatively important nursery, where presently are growing some 500,000 seedlings of species capable of adjusting themselves to the climate of this sector of Quebec, and which in due time will be used for reforesting the forest areas devastated by fire, and for road ornamentation.

Besides these three nurseries there are some light nurseries established near or within forest township reserves, in different sections of the province, and which together contained some 5½ million of trees to be used for restocking these reserves.

Since artificial reforestation has been systematically resorted to, an area of some 58,400 acres has been planted, the Government alone restocking about 42,449 acres.

Forest Researches and Duchesnay Station

It has been estimated that at least 40 per cent of the forest of this nation would benefit through the application of silviculture and scientific methods of forest development. In recognition of the importance of proper silviculture methods and forest research, there has been established at Duchesnay a research station, which comprises twenty-five buildings. Duchesnay is in close proximity to Lake St. Joseph and a Government owned forest of some 10,000 acres. Researches conducted at this experimental unit include the determination of the rate of growth of the more valuable species, measuring the influence of different silviculture methods, studies on forest pathology, etc. Worthy of particular mention is a special laboratory established in 1937 for investigation in particular of the depredations of the larch saw-fly and the spruce bud worm. These two insects have played great havoc in many of our forests,

FORESTRY IN QUEBEC

FOREST FIRES AND DAMAGE IN QUEBEC, 1924 TO 1941, INCLUSIVE

Causes	Number of Fires		Areas Burnt		Damage Caused	
	Per cent of Total	Number	Per cent of Total	Areas	Per cent of Total	\$
Clearings	38.5	6,337	36.3	1,473,414	29.5	3,411,127
Forest workers	2.7	451	7.6	314,369	11.2	1,296,958
Recreations	7.0	1,151	5.6	228,615	5.1	586,781
Travellers	13.8	2,272	12.0	487,487	18.1	2,086,639
Railroads	4.1	681	0.2	7,545	0.1	10,905
Lightning	5.4	880	6.4	260,531	4.0	465,786
Public works	0.7	108	0.1	2,616	0.2	12,419
Incendiaries	2.3	372	3.8	155,978	2.2	254,365
Unknown	15.8	2,602	18.3	742,481	9.5	1,100,171
Not classified	9.7	1,608	9.7	393,465	20.1	2,319,555
	100.0	16,462	100.0	4,066,501	100.0	11,544,706
Annual average		919.9		226,000		641,300

mainly in the Gaspé sector, killing standing trees by the million.

A special study of great economic significance, also carried on at Duchesnay station, is that made under the guidance of a specialist in the technology and chemistry of wood, relating to the possibilities of charcoal as a fuel.

A bulletin on the charcoal industry in the Province of Quebec, prepared by Dr. Risi, gives interesting information on the varieties of charcoal which can be obtained from different species. Research has also been undertaken to find a type of gas-producer capable of adaptation to trucks and to stationary motors, and with respect to the essential oils which the leaves, the wood, the bark of certain indigenous forest species are apt to furnish.

To summarize, special studies are carried out not only to find the best methods of forest development but also the best processes of wood utilization so as to encourage the use of species up to now unknown or discarded, and to foster the prosperity of the small industry depending on wood—in short, to make the forest yield all it can to the benefit of the community.

Special Schools

The higher officials of the Forest Service are recruited from the graduates of the School of Surveying and Forest Engineering, the only French school of its kind in America, which was founded in 1910. Its very extensive programme provides for four years' instruction in all the

subjects which go to form a well trained forest engineer or a surveyor, these two professions playing an important part in the exploration, management and administration of the publicly owned forests. The theoretical instruction is complemented, each year, by a period spent in the forest, in the course of which practical work is carried out. There is also an obligatory apprenticeship under a forest engineer or a surveyor, as the case may be (*). The forest rangers assisting the forest engineers are trained for their duties by a two years' course at a Rangers' School, which was established at Berthier in compliance with the law passed in 1922, and later on moved to Duchesnay.

In addition to the Rangers' School and the School of Surveying and Forest Engineering, the Government has instituted a Papermaking School for the training of skilled labour with special knowledge of the making of cellulose pulp and paper. This school, which was under the direction of the Department of Lands and Forests, has, since 1937, been administered by the Public Instruction Department.

Conclusion

Granted always that they be spared from fire, protected as they are therefrom by an elaborate and adequate protection system and a better developed forest mentality, our forests are capable, according to technicians, of meeting the demands of normally and sensibly organized industry and commerce.

(*) Since 1941 a special item (\$10,000) of the Budget provides for the granting of Scholarships to the graduates of the Ecole d'Arpentage et de Génie Forestier (Laval).



The Jacques-Cartier River



A sea of logs. Boom in Chaleur Bay, Gaspé Peninsula

The present cutting operations could be increased if it were possible to exploit all the wooded areas, if economic conditions had not necessitated limiting the exploitation to forests easily penetrated, and if the value of wood, as in certain European countries, justified the utilization of all ligneous matter that the trees produce during their existence.

In certain quarters the belief exists that the unexploited forests accumulate, continuously, ligneous matter for future cutting, the same as a capital sum of money, the annual amount of interest which it can yield normally being added thereto over a long period of years.

Not unlike this conception is the contention echoed by certain newspapers that to preserve the forests means to conserve them in the state in which nature did preserve them. That is pure illusion and misunderstanding of the mechanism of forest growth. It is, in fact, clearly demonstrated that a forest, left solely to its own initiative, at a certain phase of its evolution, ceases to grow. Having attained its maturity, such a forest would not succeed in compensating, by the growth of its young subjects, for the loss suffered by death or incapacity on the part of the veterans. The vigour of youth does not always make up for the infirmity or impotence of old age. Therefore, we would

be justified in attributing only a relative importance to the losses caused by fire, insect epidemics or cryptogamic diseases. These losses would have occurred under another form in the wooded areas when, the age of maturity and propitious time for exploitation having been attained, those forests, owing to their distance and inaccessibility, would have been denied the influence of healthy and beneficent cutting.

Leonard Botalli, physician to Charles IX and Henri III, prescribed frequent bleedings for the benefit of man's health. Is not that a salutary suggestion to be applied to our forests? Is it not a fact that, exploiting a forest, having somewhat the effect of a bleeding, would result in improving the state of the wooded areas which, in common with Molière's invalid "are dying from being too healthy"?

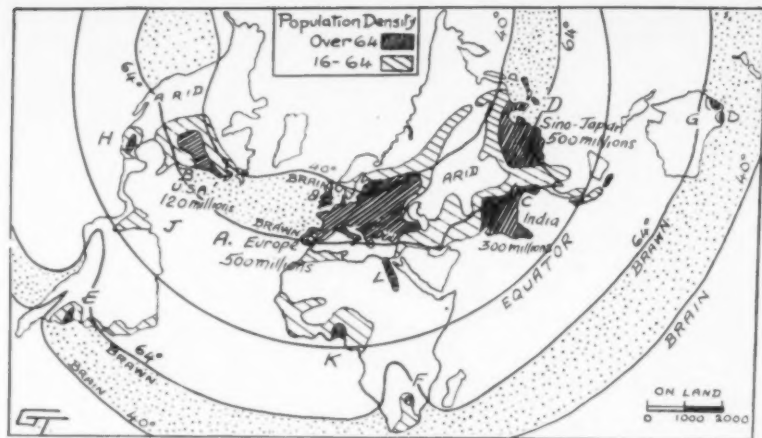
However it be, the Quebec forests, notwithstanding their appearance of having suffered from various causes, certainly constitute, as late Mgr. Laflamme used to say, the most outstanding of our national resources. The role they have played in our economy, the role they are destined to play, following a considered and intelligent exploitation, justify us in doing everything possible to conserve them where Providence assigned them a natural abode, and from where their disappearance would entail irreparable loss.

Main building of the Provincial Forest Trees Nursery, Berthierville



GEOGRAPHY AND NATION PLANNING*

by GRIFFITH TAYLOR



EVERY one in New York is familiar with the idea of town planning. It is carried out by a group of experts, who study the inevitable mistakes made in the early development of a city, show how they may be remedied and perform their chief function in planning for the future. This is just what the modern geographer tries to do, primarily for his own nation but also for the rest of the world; especially for those areas where there is room for future population. Thus he has some claim to be called a "nation planner". A good local illustration is the similar work done by the dozen young geographers under the Tennessee Valley Authority.

When historians in the future look back on the nineteenth and twentieth centuries they will note a great contrast between them. The nineteenth century was unique, since it was the time of the industrial revolution. An unprecedented increase in the world's population resulted. Workers, for the first time, crowded into huge cities, and were supported by foodstuffs brought from new grazing lands across the seas. At the same time the rich grazing lands were occupied and were becoming fairly saturated by the beginning of the twentieth century.

For this present century a quite different role is apparent. The birth rate is dropping in almost all civilized countries, and the rush to pioneer lands is no longer outstanding. The second and third-class lands will be filled relatively slowly, one hopes in accord with definite and scientific planning on the part of the authorities. Industrial expansion, based on fuel and metal resources, very largely will account for much of the future growth. Wide areas, at first used for ranching, will be

cut up for farm lands where the environments are favourable. Everywhere the key to progress will be "planning in accord with the environment", as we have seen in Soviet Russia.

Australia

One country which presents opportunities for future settlement is Australia. There, as you all know, the chief problem is how to settle the two million square miles of rather arid, hot and almost entirely empty two-thirds of Australia. There were two rather popular ideas current when I was working there; the first to the effect that Australia, being a young country exactly the same size as the United States, was likely to support over 100 millions in the near future. The other idea was that irrigation would suffice to water most of those vast, empty lands.

Both of these ideas seemed to me to be quite erroneous. As an Australian geographer, I carried out an extensive study of those foreign lands where the climate was the same as that of empty Australia, but where the population pressure was greater, since they had been longer settled. For instance, no Australian thought that Calcutta, in India, and the mouth of the Congo River, in West Africa, were suitable places for rearing white families. But it was news to them to hear that Townsville had the same climate as Calcutta, while Broome, in northwest Australia, in this respect resembled the mouth of the Congo.

About that time I devised a technique which showed how the emptier lands of the world compared in their environments

* Delivered at the New York Herald-Tribune Forum on "Pioneering for a Civilized World", New York City, November 17, 1943, and reproduced (with minor revisions by author) through the courtesy of Vital Speeches.

with the various regions of Europe — which might be considered "saturated" with its 500,000,000. This research seemed to show that Australia might support 60,000,000 at the same standards of living as in Europe (though if the Australian standards were maintained, the figure would perhaps be halved). For other new lands the figures were: United States of America, about 500 millions; Canada, 100 millions; South Africa, 75 millions; Argentina and the associated countries, 100 millions, and Siberia, 100 millions. (This last figure is too low, in view of the coal and metal discoveries made of late years.) However, the figure assigned for Australia by no means pleased Australian boosters, and certain newspapers often invited me to migrate to lands where my views would be more appreciated.

Canada

Another great region which will support further settlement is Canada. Here is a subcontinent, again with two million square miles almost devoid of settlers; but the adverse conditions here are too low temperatures and often too much water. It is rather amusing, but also rather disconcerting, to find that I am considered a dangerous optimist in certain Canadian circles, because I believe that Canada will support forty or fifty millions before it is saturated, even if we keep our high standard of living. I think I can say that my figures for Australia are now accepted, and I hope that twenty years hence my views as to Canada will be found to be reasonable. (The suggested settlement will, of course, take well over a century.)

It seems to me that the wishful thinking of the Australian authorities encouraged wild hopes as to the potentialities of empty Australia. They dreaded the population-pressure of 600 million Asiatics just to the north. In Canada, on the other hand, the authorities are wiser. It is hard to place even a few thousand immigrants quickly to-day; and so they tend to discount the possibilities somewhat, since there is no obvious need to fill our empty North. It is, however, important to remember that our empty Arctic lands lie on the air route from the Pittsburgh factories to the teeming millions of the southeast of Asia.

The long-range prophecy of the geographer regarding Canada is largely a question of considering what other settlers in Europe and Siberia have done under

similar conditions. The northern boundary of agriculture is usually placed near the temperature line of 56 degrees Fahrenheit in July. This line runs across Newfoundland to James Bay, and then swoops to the northwest to the mouth of the Mackenzie on the Arctic Circle. From here it runs due south along the edge of the Rockies, but, owing to the high mountains of British Columbia, not much of this latter province is favoured with warm summer conditions. Present-day agriculture reaches little beyond Edmonton, so that the promising triangle containing about 500,000 square miles lies to the north of the city. It extends along the whole length of the Mackenzie, where potatoes ripen and where barley and oats do well in most seasons, while meadow hay can be grown where the soils are suitable. The Alaska route is helping to open up the western edge of this area.

We cannot, of course, be sure of the crop possibilities until adequate soil surveys are carried out, but there is no reason to believe that soils are worse here than in the similar marginal country of Finland and Russia. The Russian area is about twice the extent of the Canadian, but, while many Canadians seem content with our population of 11,000,000, the Russians expect about 100,000,000 to settle in or near similar country in Siberia.

We all know that the wealth and prosperity of Britain, Germany and the United States depend largely on the enormous resources of coal in those countries. The coal resources of the Canadian province of Alberta are among the largest in the world. Deposits have been estimated as 600 billion tons. Other extensive deposits occur in southeastern and northeastern British Columbia. If the Russians (in Siberian lands like those in or north of Alberta) can develop huge industrial towns on Kuznetsk coal and distant Magnitogorsk iron, why cannot we do the same thing in Alberta at a later stage of our geographical development?

There are large areas of Ontario and southern Quebec which lie on the warmer side of our 56-temperature line. Here in general is the great Shield, a vast expanse of lakes and muskeg covered with coniferous forest. The current belief that it is largely bare granite is wrong, for less than 10 per

cent is devoid of soil and forest. Here, then, we have a great contrast with empty Australia. In empty Canada there is unlimited water, widespread fur and fish, plenty of water power, and also vast forests for fuel and, with wise conservation, a good deal of timber and paper pulp. The summer is hot enough for potatoes, barley and grass; so that in the distant future we shall see a scattered but, in the aggregate, large population in this zone.

It is, however, not satisfactory country for unassisted immigrants in its present condition. Lack of drainage is a greater drawback than the short duration of summer, and the drainage of these huge areas of rather swampy soil can only be carried out by vast government expenditure. The present is not the time to do this, but it will be done when the better parts of newly settled Canada are saturated. The Chinese manages to raise his family on the crops of less than an acre of land; the Silesian farmer needs forty acres; at present the prairies farmer requires over 400 acres. We may be sure that a century or so ago the Silesian farmer, who lives in a climate not unlike that of the prairies, found it necessary to farm a much larger holding. Now, with large populations near at hand, he finds a ready market for his produce, whereas in marginal lands all over the world the costs of transport tends to swallow all the profits.

Common Sense Geopolitics

Before considering the empty lands in the Southern Hemisphere let us now turn to another branch of geography, that which we may term legitimate, as opposed to German, geopolitics. Can geographers give us some idea as to the probable industrial powers of the nations in the future?

First, the climatic factors, which determine human energy, are important. The eminent geographer, Ellsworth Huntington, has shown that the temperature line for 40 degrees Fahrenheit accompanies the best mental work. This line runs a little north of the international boundary in Canada. It just misses the United States. It passes through Scotland, south Sweden, Moscow, and so to Vladivostok. He has decided that the best conditions for physical work are near the temperature-line of 64 degrees Fahrenheit, which runs parallel to the other; through Los Angeles, Savannah, Lisbon, Athens, Persia and Shanghai. Clearly in the broad

zone between these two lines we have "the best of both worlds", the mental and the physical — the brain and the brawn.

However, large and flourishing populations cannot develop in arid lands, and this cuts out much of the central part of Asia. The three areas which are left, and which the speaker (who is somewhat of a determinist), believes will always continue to lead the world, are the United States, Europe (with U. S. S. R. much the dominant member), and China.

What about the material resources, which undoubtedly are even more important as regards heavy industry? They are iron ores, coal resources, water power and petroleum. I have prepared graphs of these resources for the Chief Axis and Allied countries, and the results are very interesting. Under present conditions of industry, it is a case of the United States "first and the rest nowhere". These graphs of power (which I have termed dynographs), show that the U. S. S. R. is likely to be the sole rival of the United States and may even surpass her in the future. Germany comes next, a long way behind the two giants; then close behind are Britain, France and Japan, with Italy much lower. I know no illustration which better brings home the irremediable mistake which Hitler made, when Germany and Italy (with France under Hitler's feet), left Britain unattacked, and, in a sense, wantonly provoked the giants, the United States and U. S. S. R.

South America

We may now turn to South America in our Century Plan for the New Lands of the World. It is easy to reach almost any part of the continent by airways, but how about the roads? What is the present condition of the 13,000 miles of the Pan-American Highway from Alaska to Buenos Aires? The greater part of it in the southern continent is ready, from Medellin (near Panama) to Valparaiso and Buenos Aires. Only south of Quito is there about 200 miles of bad trail. In Central America there are rather long gaps in Costa Rica and south of Oaxaca, but most of the remaining 2,000 miles between Laredo and Panama is ready. North of the main roads of Canada, this road is continued as the Alaska Route on to Fairbanks, an additional 1,600 miles. But this great road is likely to be more useful in promoting Pan-American friendship and knowledge

than for extensive trade, since it is paralleled by adequate shipping routes most of the way.

South America is the hot-wet continent. Here is a great expanse of tropical jungles which so far have resisted close settlement. The soils on the whole seem poor, and even though they produce some tree crops like rubber, nuts, timber and oils, they have not been found suitable for exploitation by large numbers of progressive peoples.

On the polar side of the Brazilian jungles, as in other continents where there is a long "winter season without rain" we find a belt of warm grasslands. This location is the world's chief grazing and grain area, so perhaps it offers the chief field for future progressive settlement. The humid, uncomfortable, wet season is the chief drawback, though I look to "central cooling" to remove some of the grave disadvantages of such climates in the near future.

The temperate portions of South America, found chiefly in Argentina and south Brazil, have a fairly satisfactory environment; but in many cases the control of all the land is in the hands of the hacienda (ranch) owners, who will only rent their land to farmers. In the true marginal lands of southern Brazil, conditions of permanent tenure are better; but lack of communications, distance to markets, etc., as in Canada, have resulted in the failure of many promising settlements. Here, as elsewhere, the pioneer regions will only be settled slowly. A stable, enlightened government will, in the future, carry out improvements beyond the means of the individual — as has been done in western United States. However, certain German estimates of 1,000 million progressive inhabitants in the Brazil of the future seem fantastic in my opinion.

African Prospects

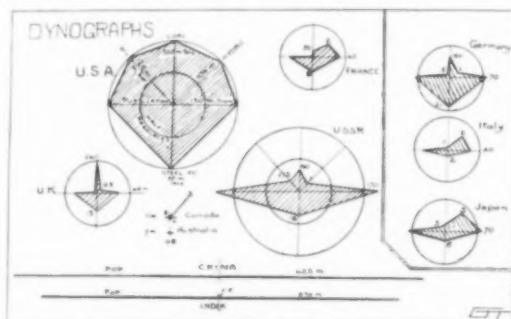
In Africa we have a continent which extends equally each side of the Equator, and just reaches into those vine and wheat regions which have a "Mediterranean" environment. Unlike the lands so far discussed, there is already a large primitive population (132 millions out of 135 millions) of Africa which is quite experienced in warm-climate agriculture of a sort. Elevation is the key to future white settlement here; for much of the east and south of Africa is plateau land, and so the tempera-

tures are cooler than their latitudes would suggest.

It seems to be generally accepted that only elevations above 4,500 feet are suitable for European settlement in the relatively empty lands of Kenya, Tanganyika and Rhodesia. Unfortunately, the tropical diseases carried to man and beast by the tsetse fly are grave disabilities in much of this wide expanse, though luckily they are not prevalent on the higher ground. Profitable crops which will pay for the long transport to lands of consumption are hard to find. Coffee is succeeding in parts of Kenya, but a plantation system (using Negro labour) is not likely to lead to important white settlement. That is being used in part, but is being discouraged, in general, by the authorities. Moreover the trade of the country is largely in the hands of natives of India, of whom 300,000 live in Kenya alone. In Tanganyika and northern Rhodesia, the same disabilities occur, so that the total white population of these two elevated territories is only about 19,000 after several decades of colonization. Kenya has about 21,000 whites.

Southern Rhodesia has a belt of highlands across the centre which is available for Europeans, and here are about 53,000 folk of that type. Maize and tobacco are the chief crops. Here, as in South America, we may be sure that the population will increase considerably in the future, but it will be a slow process, not much resembling the earlier settlement of the American, Canadian, Siberian and Manchurian prairies.

I would like to emphasize that point, that there have been two very well marked stages in this development of the future that we are interested in to-day: the first, relatively easy settlement which tackled these great, rich prairie lands which are found in America, in Canada, in Manchuria



and Siberia, but unfortunately are not found in large areas in any other part of the world. And I said a little earlier, we are beginning now to settle the third and the fourth-class lands, a longer process, a much more difficult one, but one which, in the long run, will produce important populations, just as we have seen, for instance, in Finland, in northern Russia and in plenty of places in the older regions of settlement which seemed very hopeless, I am sure, when they first started.

There is another continent greater than Australia or Europe, a "new land" (without an inhabitant) with which I have some familiarity. What is the future of Antarctica? Apart from some widespread seams of coal, in the sole ridge of extensive mountains projecting above the ice cap, it has no economic possibilities. Nor is it, like the Arctic area, athwart some of the main

flying routes. To every type of scientist it is full of interest, but as a field for settlement these five million square miles of ice are useless.

My rapid survey of the "new lands" is ended. Our statesmen have declared that the resources of the world — especially in the unexploited regions — will be shared among the various nations more equally after the war. It should be apparent that specialized geographical research in the distributions and comparative values of various resources will contribute greatly to that international harmony, which we all long to reach.

Is it not time that Canada realized that the standard of geography in the schools is probably the lowest of any literate nation? It is only comparable with the status of the subject in England thirty years ago.

EDITOR'S NOTE-BOOK

Major George F. G. Stanley—see biographical sketch in C. G. J., March, 1944.

Dr. Griffith Taylor—see C. G. J., March, 1936; May, 1937; January, 1940; June, 1940; May, 1941; September, 1941.

Avila Bédard, I.S.O., whose illuminating article, "Forestry in Quebec: Past—Present—Future", appears in this month's issue of the Journal, attended the Seminary of Quebec from 1896 to 1905 (B. A., 1905) and Yale University from 1905 to 1907 (M. F., 1907). Besides his degrees, he has received three honorary distinctions, being awarded the Imperial Service Order by His Majesty the King in 1943, the Decoration of Polonia Restituta, and the Decoration of the Merite Agricole of France at the Centenary of the Ecole des Eaux et Forêts de Nancy. Since 1907 Mr. Bédard has been with the Quebec Department of Lands and Forests, becoming Deputy Minister in 1937. He has also been dean of the Ecole d'Arpentage et de Génie Forestier, Laval University, since 1918; professor of silviculture, dendrology, management, dendrometry and history of silviculture since 1910; member of the Commission of Inquiry on Pulpwood; member of the Postwar Rehabilitation Committee; president of L'Association Forestière Québécoise. In addition, he has

found time for a great deal of literary activity, which included serving as editor of two magazines, *Vie Forestière et Rurale*, and *La Forêt et la Ferme*; being a corresponding member of La Société de Recherches de La Finlande; besides becoming author of *L'Arbre et la Forêt*, *Traduction des Noms Géographiques*, *L'Ecole d'Arpentage et de Génie Forestier*, *Honoré Mercier* and *Rôle Economique de la Forêt dans l'Economie d'un Pays*, as well as various articles in forestry magazines. We are indeed happy to welcome a writer of Mr. Bédard's knowledge and experience to the pages of our Journal.

AMONGST THE NEW BOOKS

Literary England; Pictures of the many places made famous in English literature with the well-loved passages which made them forever memorable, by DAVID E. SCHERMAN and RICHARD WILCOX. (Toronto: MacMillans in Canada, 1944, \$5.50).

Bound in blue and gold, this attractive quarto volume of fifty full-page photographs has also an unusually attractive format and design. The pictures are the work of David Scherman, and the descriptive text is by associate editor Richard Wilcox of *Life*, who selected also the appropriate passages from English prose and poetry which accompany each scene. So enduring is tradition in England that one is only slightly surprised to find that places which seemed to belong only to legend or to be a figment of the author's imagination actually exist to-day. True, the first picture, of Tintagel Castle, has all the wildness and mystery

(Continued on page XI)



GEORGE JOSEPH DESBARATS.
C.M.G., B.A.Sc., D.A.Sc.

THE Canadian Geographical Society has been singularly fortunate in its Presidents. There have, of course, been only two of them in fifteen years, and of the two one was a bureaucrat and the other is still a bureaucrat. That may be received in shocked silence by many people. It is true that one of the definitions of a bureaucrat is a 'government official', and that sounds harmless enough. There are plenty of harmless, or relatively harmless, government officials. But this generation has been nourished on the idea that a bureaucrat is something definitely obnoxious, a sort of modern tyrant, an animated autocrat of "red tape", surrounded by supercilious secretaries who assure you that he is now in conference, undemocratic, unapproachable, and deaf to all reason if you did manage to get into his luxurious office.

If there are such personages, George Joseph Desbarats was not one of them. Any of our older members who had occasion to visit him on official business during the years before, during and after the First Great War, when he filled in succession the important positions of Deputy Minister of Marine and Fisheries, Deputy Minister of the Naval Service of Canada, and Deputy Minister of National Defence, will remember him as one who was never too busy to see any one who had, or thought he had, something important to say to him; who was always courteous and kindly, even to those whose views did not at all agree with his own; and who was always receptive to helpful ideas from any source. If all bureaucrats were like the late Dr. Desbarats, the popular notion would die of its own absurdity.

The high qualities of Dr. Desbarats as a servant of the State were recognized not only by his long years of employment in positions of unusual trust and responsibility, but also in his appointment to represent the Dominion at the International Wireless Conference in London in 1912, and the Sea-

men's Conference of the League of Nations at Genoa in 1920, as well as in the award to him by the King of a Companionship in the Order of St. Michael and St. George in 1915. His contributions to engineering knowledge and practice were fittingly remembered when, in January, 1944, the University of Montreal gave him the honorary degree of Doctor of Applied Science; and when, a few days afterward, the Engineering Institute of Canada presented him with the Julian C. Smith medal for "achievements in the development of Canada".

Born eighty-three years ago, the son of an old and highly-esteemed French-Canadian family, his father having been for some years Queen's Printer, Dr. Desbarats was a graduate with honours of the Polytechnic School in Montreal, and afterwards filled various technical offices in the Dominion service, notably that of Director of the Government Shipyard at Sorel, where, among other things, he was responsible for the transformation from wooden ship construction to steel. The excellence of his work at Sorel led naturally to his promotion to the deputy ministry of Marine and Fisheries.

Later he was to take an important part in the organization of the Naval Services of Canada, which have since grown to such notable dimensions, his responsibilities covering both the hydrographic surveys and the early beginnings of our radio service. With the outbreak of the First Great War in 1914, Dr. Desbarats' duties became much more urgent and onerous. Among many other things he was responsible for providing what was then a considerable fleet of ships to patrol the Canadian coastal waters. He also acted as an adviser to the British Government on the construction of trawlers and submarines, and organized his department so that it could act efficiently as purchasing agent for the British Admiralty in Canada of food and clothing for the Royal Navy. Later he had the responsibility

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of organizing the many-sided Department of National Defence, in which the various interests of the army, the navy and the air services were combined. Naval dockyards at Halifax and Esquimalt came under his jurisdiction, and his wide engineering knowledge enabled him to give competent direction to the establishment, under the Royal Canadian Corps of Signals, of radio communications throughout the Mackenzie Valley and the Yukon Territory, and the setting up of radio and direction-finding stations for airmail routes.

At the age of seventy-two, after years of painstaking and loyal and efficient service to the State, Dr. Desbarats retired from the public service. That, however, did not mean that he proposed to spend his remaining years in idleness. His sense of responsibility as a citizen, as well as his boundless energy and resourcefulness, made idleness impossible. His interest in scientific matters, and particularly in engineering problems, remained as keen as ever, and he was not only for years an active member of the Engineering Institute, but served for a time as its President. For years he was also a hard-working and highly valued member of the Canadian Red Cross Society, in which he was both a Life Member and a member of the Central Council. He was also Vice-President as well as Chairman of the Purchasing Committee of the Ottawa Branch of the Society, and, up to a short time before his death, made it his practice to go to the Red Cross offices two or three days every week to look after requisitions from the local military hospital, and other duties.

It was characteristic of his wide interest in and capacity for real service that, when he had already passed his eightieth birthday, he not only continued to be an active member of The Canadian Geographical Society, but, at the earnest solicitation of his fellow-members, took on the additional responsibility of President. His immediate associates on the Board of Directors know how faithfully he carried out the duties of his office; how conscientiously he made himself familiar with every detail of the Society's activities; how patiently and efficiently he presided at the meetings of the Board and of the Executive Committee; and how companionable he was on all occasions.

The Board of Directors, on behalf of the Society, put their heartfelt respect and affection into the following resolution:

Resolved that the Committee, on behalf of the Directors, members and staff of The Canadian Geographical Society, record its feeling of great loss in the passing of Dr. Desbarats, who as Director and as President has given so generously and ably of his time, experience and judgment to the well-being of the Society; and that a copy of this Resolution be sent to Mrs. Desbarats with the sympathy of the Board.

In the death of George Joseph Desbarats, Canada has lost one who was a good citizen, a ripe scholar, a man of fine character, and a faithful and kindly friend.

L. J. B.

IX

ARTICLES PUBLISHED IN THE CANADIAN GEOGRAPHICAL JOURNAL

DEALING WITH ECONOMICS, AVIATION AND NATURAL RESOURCES

IN our May, 1944, issue, we provided an index of articles published in the Journal dealing with World War II and Reconstruction. The following lists are presented this month for the further convenience of our readers.

ECONOMIC SERIES: COMMERCIAL AND INDUSTRIAL

1940	February	Canada's Shipbuilding Industry by WESTON GAUL	June	His Majesty's Land Ship — the Tank by DELACOUR BEAMISH	
	May	South of the Border — and North by ARTHUR L. NEAL	June	Wheels for the Armed Forces by J. H. BERRY	
	July	Rubber and its Manufacture in Canada by ARTHUR L. NEAL	July	Anti-Axis Ammunition	
	August	The Co-operative Movement by EVELYN S. TUFTS	December	The Motor Car Industry Makes Victory its Business by T. R. ELLIOTT	
	August	Refrigeration — the Silent Service by ALLAN C. MACNEISH	1943	April	Distribution of National Income and Purchasing Power by C. M. SHORT
1941	September	Cheese as a Wartime Necessity by RALPH PURSER		June	Cattle Ranching in British Columbia by C. O'B. FRENCH
	September	War and Mobility by D. J. RICHARDS	September	The Saguenay Valley — and Aluminum by B. J. MCGUIRE	
1942	March	Canada's Aircraft Industry by RALPH P. BELL	October	The Bulb Industry of British Columbia by R. J. HASTINGS	
	April	Canadian Cargo Boats to Bridge the Atlantic by CHARLES CLAY	November	The "Canol" Project — Canada Provides Oil for the Allies by OLIVER B. HOPKINS	
	April	Canada Builds a Navy by DESMOND A. CLARKE	1944	March	The Why and Wherefore of War Finance by C. M. SHORT
	May	Guns — and Canada by A. G. CAMPBELL			

AVIATION SERIES

1936	October	Commercial Flying in Canada by J. P. DE WET	1940	June	Canada's Air Force Overseas by JAMES FERGUSON
	November	An Eleven Thousand Mile Inspection Trip by SIR JAMES MACBRIEN		July	British Commonwealth Air Training Plan by F/O J. FERGUS GRANT
1937	February	Trans-Canada Airway by J. FERGUS GRANT	1941	March	Geography from the Air by RALPH PURSER
	June	Flying Club Training in Can- ada by GEORGE M. ROSS		1942	March
	August	North to the Yukon by Air by J. FERGUS GRANT	December		R.C.A.F. Overseas by Flt. LT. BASIL DEAN
1938	August	Canada's Aircraft Industry by J. FERGUS GRANT	1943	March	Northwest Passage by Air by J. A. WILSON
1939	May	Across Canada by Air by J. FERGUS GRANT		October	"Home War" — the R.C.A.F. Guards our Shores by L. M. McKECHNIE, F/O N. A. FOLLAND, F/O S. P. CROMIE
	October	Aircraft Conquer Atlantic by J. FERGUS GRANT	October	Canada's Northern Air Routes by D. B. WALLACE	
	December	New Wings for the Yukon Mail by J. HARPER PROWSE			

NATURAL RESOURCES SERIES

1940 April	Sport Fishing in Canada's National Parks (Aquaculture) by D. S. RAWSON	November	Steep Rock Iron Mine by W. J. GORMAN
October	Prairie Farm Rehabilitation by E. S. ARCHIBALD	1943 May	Are We Using Canada's Wealth Aright? by R. C. WALLACE
1941 April	Trees of our Western Forests by HAMILTON M. LAING	September	The Saguenay Valley — and Aluminum by B. J. MCGUIRE
June	North of the Great Lakes Lies Treasure by MAURICE TREMBLAY	November	The "Canol" Project — Canada Provides Oil for the Allies by OLIVER B. HOPKINS
October	Northern Ontario by R. M. SMITH	December	Planning the New Northwest by CHARLES CAMSELL
November	Canada Moves North by RICHARD FINNIE	1944 February	Research in Prairie Farm Rehabilitation by E. S. ARCHIBALD and WILLIAM DICKSON
1942 May	Adaptation of Crops in Ontario by L. J. CHAPMAN	April	Agriculture in Quebec: Past — Present — Future by Hon. J. ADELARD GODOBOUT
June	Research Touches the North (the Tar Sands of Alberta) by S. C. ELLS	April	Maritime Dykeland Rehabilitation by E. S. ARCHIBALD
July	Natural Resources and Their Conservation by CHARLES CAMSELL		
September	The History and Status of Forestry in Ontario		

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(Continued from page VII)

that thrilled us long ago in the pages of the *Morte D'Arthur* and the *Idylls of the King*, but who would expect to see the "wild water" into which Sir Bedivere cast King Arthur's sword Excalibur at the dying lord's behest? Here it is, a small rush-bordered lake on lonely Bodmin Moor in Cornwall, now known as Dozmary Pool. In the pictured ruins of its Abbey one feels anew the spell of Glastonbury, with its sacred memories of the Holy Grail, said to be buried by Joseph of Arimathea where now an ancient monument marks the Blood Spring, and where the winter thorn he planted "blossoms at Christmas, mindful of our Lord".

There are sunny views of Alfred's Isle of Athelney, of the Malvern Hills where William Langland on a May morning saw his Vision of Piers Plowman, of swans gliding down the Thames, calling to mind Spenser's *Prothalamion*, lovely dreaming glimpses of Winchester and Canterbury and of Izaak Walton's little river Itchen, where two boys are seen following his "calm, quiet innocent recreation of angling". The pictures of Clunbury and Ludlow Castle bring memories of "The Shropshire Lad".

"Leave your home behind, lad,
And reach your friends your hand,
And go, and luck go with you
While Ludlow's towers shall stand."

Facing Browning's "Oh to be in England!" we have an exquisite photograph of an English elm against the sky at dawn. Another glorious tree picture shows a huge gnarled oak in Robin Hood's Sherwood Forest.

Only a few of the photographs give evidence of the havoc wrought by war. Though the Warm Springs at Bath would seem to have escaped unscathed, the famous Assembly Rooms were sadly wrecked. How Mr. Pickwick would grieve, for it was here that he soothed his spirits after his breach-of-promise suit, and here several of Jane Austen's heroines "met their fates" in circumstances of the greatest decorum. Another war casualty is St. Clement Danes, in the Strand, of which only the walls and spire remain. The photograph, though beautiful, wrings the heart, especially of lovers of Dr. Johnson, whose pew in this lovely Wren church had long been a literary shrine. Here again are

(Continued on page XVIII)



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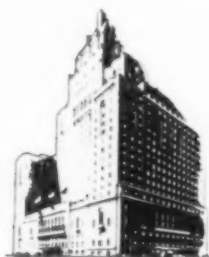
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inimitable way his youthful pilgrimages over the
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sequel which he hopes will shortly be undertaken
by the makers of this wholly delightful book.

F. E. FORSEY

Burning An Empire, by STEWART H. HOLBROOK
(The MacMillan Company, Toronto, \$2.75). This
book is an account of some of the great fires that
have devastated the forests of North America, from
the Miramichi fire of 1825 in New Brunswick to
recent burns in Washington and Oregon, such as the
Tillamook fire of 1933. While making no attempt to
include all great forest fires, an undertaking which
might be comparable to compiling a new edition
of the *Encyclopaedia Britannica*, the author has
selected for description many of those which will
go down in history as major catastrophes, and has
carefully collected contemporary accounts of their
terrible destruction of life and property. The book
includes a discussion of the major causes of forest
fires, and, contrary to general belief, land hungry
settler and the casual traveller appear to bear the
greater part of the blame, rather than the lumberman
on whom it has been more commonly placed. The
author also outlines briefly the latest methods of
fighting fires, including dropping supplies and men
from aircraft by parachutes and the actual suppres-
sion of fire by bombing with some type of fire
extinguisher.

There are few districts in Canada that have not,
at one time or another, been menaced by forest fires,
and scarcely a summer passes without the occurrence
of fires, which, though not as deadly as that which
carried destruction through the Gowganda district
not so many years ago, yearly lay waste to thousands
of acres of our dwindling forest resources. Those
who have seen the pall of smoke thinning or becoming
denser as the wind shifted, the ashes falling on the
tinder-dry bush, the rafts prepared beside a lake
as places of refuge in case of emergency, and who
have experienced that tense sense of impending
disaster, will realize how vividly these blazing
infernos have been portrayed by Mr. Holbrook. An
excellent book which will be appreciated by all who
are interested in the preservation of our forests and
their game, our water resources and even the
soil itself.

P. E. P.

(Continued from page XI)

famous streets and houses, lovely hills and rivers,
and glimpses of the rocky shores of England,
immortalized by Dickens, Thackeray, Wordsworth,
Keats, George Eliot, Emily Bronte, Matthew
Arnold and many other well-loved authors, a rich
feast of enchanting pictures and aptly-chosen
quotations to which the reader will return again
and again. He will read and re-read, too, the truly
magnificent preface by Christopher Morley, an
essay on *The Sense of Place*, recalling in his own

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